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Universal Design and Nature Trails: Balancing Accessibility, Site Integrity, and the Recreation Experience

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UNIVERSAL DESIGN AND NATURE TRAILS: BALANCING ACCESSIBILITY, SITE INTEGRITY, AND THE RECREATION EXPERIENCE

by

Steve Kirkindall, M. Ed.

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BALANCING ACCESSIBILITY, SITE INTEGRITY,
AND THE RECREATION EXPERIENCE

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ABSTRACT

This study addressed the application of Americans With Disabilities Act (ADA) guidelines in outdoor recreation settings. The purpose was three-fold: to develop site- and user-friendly design principles for non-urban, accessible nature trails; to design and construct a trail based on those principles; and to evaluate both principles and trail by surveying trail users. The Delphi Method was employed with a national panel to assess current expert opinion regarding accessibility and trails. Fifty-nine principles were developed from combined results of panel deliberations and applied experience gained constructing a prototype trail utilizing the universal design concept.

Trail users rated the importance of these principles and how well the trail met their needs, expectations, and preferences. Questionnaires addressed whether there were differences in responses between users with and without disabilities. There were few significant differences between the two groups. Both groups substantiated the desirability of trails that permit access and promote enjoyable experiences for *all* users, but neither demonstrated interest in the specifics of how this is achieved, *as long as site integrity is not compromised.* The prototype trail was highly rated primarily because it provided universal access and quality recreation opportunities with minimal apparent impact to the site's physical features and aesthetic qualities.

DEDICATION

With gratitude and love,

This dissertation is dedicated to my parents,

Bill and Margaret Kirkindall.

ACKNOWLEDGMENTS

To the members of my committee, I express my appreciation for their individual and collective contributions to the completion of this dissertation. A debt of gratitude is also owed to the members of the Delphi panel. A special tribute is offered to the Trail Dawgs without whom the vision of the SFA Trail would never have become reality. It has been my privilege to work with Dr. Ron Thill, whose friendship and unfailing support have meant so much. I am deeply grateful for all he has done. For the inspiration and the laughter, without which this entire process would have been very grim, I thank my best friend, Mike Russell. And for loving me through it all, Mary, thank you.

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INTRODUCTION

On July 26, 1990, President Bush signed into law the Americans with Disabilities Act (ADA). Passage of the ADA marked a legal milestone of equality and freedom for individuals with disabilities. Federal and state agencies and departments were mandated to remove physical and social barriers to accommodate the needs of all individuals (PLAE, 1993). This mandate represents an especially difficult task for outdoor recreation managers, particularly those responsible for administration of facilities featuring recreation trails.

Efforts have been made to increase levels of accessibility at numerous parks and forest recreation areas; however, many users, including people with disabilities, find their experiences at accessible facilities unsatisfying for a variety of reasons (Veverka, 1980). In an effort to comply with ADA standards, many sites have retro-fitted existing facilities with the primary objective of accommodating disabled visitors at the site's front-line elements. Thus parking facilities, visitor centers, fishing piers, day use/picnic areas, and restrooms are the areas which have largely been the focus of efforts to increase accessibility (Morgan, 1997). Consequently, trails and many primary attractions at recreation areas remain inaccessible, limiting recreational opportunities for disabled visitors.

Designed for the average person, most outdoor recreation facilities and programs exclude disabled persons from full participation (PLAE, 1993). The removal of barriers and the addition of ramps, hand rails, signage, and space can alter many existing buildings, structures, and amenities to accommodate

disabled or physically handicapped persons. However, compliance with ADA standards in providing accessible recreational nature trails represents a different kind of challenge with a complicating consideration. The potential exists to destroy or compromise the value of the resource, which is often featured in recreational plans for its remote or aesthetic natural qualities.

Arguments have been made that the relatively small number of wheelchair-mobile individuals does not justify the effort and expense to provide accessible outdoor recreational opportunities. While it is true that the 1.8 million wheelchair users are a distinct minority among the disabled population (McNeil, 1994), the barrier-free design required for wheelchair accessibility is the baseline for accommodation of other disabilities (PLAE, 1993). Furthermore, this perspective fails to take into account the extended social circles of family members and friends who are denied the chance to share outdoor experiences with those who have disabilities. It is neither economically nor logistically feasible to retro-fit many existing trails: often site or initial design characteristics preclude retro-fitting. There is, therefore, a need to provide new trails that are designed and built to be universally accessible.

Guidelines currently exist which specify requirements for ADA compliance with respect to outdoor recreation, but little has been written about how to implement those guidelines, especially with respect to recreation trails. Even less is known about how to increase accessibility in a way that enhances user satisfaction without dramatically compromising the natural character of the resource. Furthermore, the lack of readily available examples of such trails has contributed to the reluctance of resource managers to undertake new trail construction (McDonald, 1997).

Without a guiding set of principles and successful examples of their application, recreation managers are faced with a disjointed and incremental approach to providing accessible trails. There is need for a set of guidelines which demonstrate how to apply the specific criteria of ADA requirements to the construction of new trails which will not only comply with the law, but will simultaneously embrace concepts of outdoor resource conservation and management.

The purpose of this study was to address design methodology needs for universally accessible nature trails with an approach that balances ADA guidelines with the integrity of the natural resource and the recreation experience.

The objectives were:

1. To develop principles for application of ADA criteria in recreation trail design and construction which provide universal accessibility while:
    A. minimizing social as well as physical barriers for visitors with disabilities.
    B. minimizing creation of aesthetic barriers.
    C. preserving and protecting the integrity of the resource.
2. To evaluate these planning, design, and construction principles on a recreation trail developed with the above objectives.

LITERATURE REVIEW

People are drawn to outdoor recreation for many reasons. These range from the need for solitude in primitive backcountry, to preference for rustic campsites in the woods, to desire for social settings with convenient facilities. Regardless of their reasons, they all seek to enjoy an outdoor experience (PLAE, 1993). Studies indicate that people with disabilities do not differ from the general public with regard to their interests and preferences in outdoor recreation experiences and that they have recreational goals similar to the majority of able-bodied recreationists (Beechel, 1975; Moore, 1996).

Indeed, there seems to be a universal need for communion with nature as evidenced by growing demands for variety in recreational opportunities and a socially diverse interest in non-consumptive uses of natural resources (U. S. Department of Agriculture, 1992). However, traditional facilities have been designed for the "average" (PLAE, 1993, p. 17) person, and those with disabilities or handicaps have found it difficult or impossible to fully participate in a broad range of outdoor recreation experiences and settings. In such cases, people with disabilities are, due to physical barriers, denied opportunities to enjoy the natural beauty and environmental features that these outdoor areas provide.

Evolution of Cultural Awareness of Disability Issues

Disability has been defined in a cultural context as an inability or limitation in performing socially defined activities and roles expected of individuals within a social and physical environment (Pope, 1991). As an expression of mental or physical limitation in a social context, disabilities may be thought of as the gap between an individual's capabilities and the demands of the environment. The existence and degree of disability, then, may be determined by the interaction of physical or mental limitations with social and environmental factors (PLAE, 1993). Disabling conditions include intellectual limitations, sensory limitations, chronic diseases, mobility limitations, and others.

According to the U.S. Census Bureau, the current total U.S. population is 273,379,865 (U.S. Dept. of Commerce, 1999). There are approximately 54 million (one in five) with disabling conditions that interfere with their activities, and more than 26 million (one in ten) people have severe disabilities (U.S. Dept. of Commerce, 1997). Nearly 10% of Americans have physical or mental conditions that keep them from being able to work, attend school, or maintain a household (McNeil, 1994). When family and friends of persons with disabilities are given consideration, well over 100 million people, between one-third and one-half of the population of the United States, experience limitations or restrictions in their choices of life activities (PLAE, 1993). The myth of the average person and the design paradigm upon which it is based have resulted in development of physical environments that are inaccessible and often hostile to many people (Kidd, 1982).

The concept of mitigating disabilities by decreasing social barriers can be traced to a vocational rehabilitation program authorized by Congress to benefit disabled World War I veterans in 1919. However, it was not until the publication of *Tentative Guide: Facilities in Public Buildings for Persons with Ambulatory Impairments* by Dwight York in 1959 that the movement toward barrier-free design was given impetus. This concept has continued to evolve, reflecting societal recognition of a moral responsibility to offer all Americans opportunities to enjoy basic human rights with dignity.

Passage of ADA and development of the "universal design" (PLAE, 1993, p. 21) philosophy, which encourages a more comprehensive and integrated view of people (with and without disabilities), are the result of this process. This concept evolved from the original "average human being" (PLAE, 1993, p. 21) (traditional) paradigm, the barrier-free or "wheelchair" (PLAE, 1913, p. 21) paradigm, and the Enabler model, which helped designers visualize different disabilities. The Enabler Model considers 15 different disability concerns, categorized in terms of mental functions, the senses, and motor impairment. It also considers "invisible" disabilities like lack of stamina and extremes of size and weight. Universal design considers anthropometrics, spatial requirements and other needs of people with disabilities and accommodates these needs in a fashion that also addresses the abilities and needs of the able-bodied population, incorporating features designed to accommodate both groups (PLAE, 1993).

With development of national standards that specify how accessibility must be provided, a legal definition for the term "accessible" came into being. The Uniform Federal Accessibility Standards (UFAS) define an accessible facility

or site as one that can be approached, entered, and used by physically disabled people (ATBCB, 1988). Along with the focus on accessibility, a reformation in the conceptual approach to design criteria began to take place.

Accessibility and Outdoor Recreation

Development of new standards and design concepts pose an especially difficult challenge for managers of outdoor recreation facilities. The outdoor recreation environment is fundamentally different from the human-made (built) environment. The built environment is one of well-defined, fixed parameters designed to accommodate the ordinary and essential activities of daily life (Meade, 1994). The outdoor recreation environment represents dynamic, challenging opportunities for leisure and extraordinary activities (Meade, 1994). Yet, published standards of accessibility are consistent for both environments.

Determination of the degree of accessibility and factors which dictate the application of standards in outdoor recreation sites are based upon classification of setting, type of access, and difficulty level rating - all defined primarily in terms of perceivable modifications to the natural environment (PLAE, 1993). Setting classifications include Urban/Rural, Roaded Natural, Semi-Primitive, and Primitive. Types of access (paths) are Outdoor Recreation Access Routes and Recreation Trails. Levels of difficulty are named Easy, Moderate, Difficult, and Most Difficult. Each category and rating has its own level of accessibility as well as visitor expectations (PLAE, 1993).

Two types of paths are defined. Outdoor Recreation Access Routes are paths that provide access to a site's primary developed recreation activities and elements. Recreation Trails are paths that provide access to a site's other,

lesser-developed recreation activities and elements (PLAE, 1993). Recreation Trails typically exceed 1/4 mile in length and take visitors into lesser-developed areas where natural features are emphasized. Where other more developed activities or elements do not exist, the Recreation Trail is often the primary element or attraction of a site. One of the greatest values of a Recreation Trail is its potential to offer contemplative or reflective recreation. Management committed to contemplative recreation should provide such opportunities by assuring that accessible places are not so deprived of their natural qualities as to put such experience beyond the visitor's reach (Sax, 1980).

Providing quality trail opportunities that protect both the resource and the recreation experience is a major concern and challenge (U. S. Department of Agriculture, 1981). In a 1992 report to the President by the National Council on Disability, David Park, Chief, Special Programs and Populations Branch, NPS, noted that the concurrent goals of accessibility and preservation are not antithetical, but rather a matter of "finding effective ways to balance the intent of both and finding ways to provide the highest level access with the lowest level impact on the environment" (Inquiry, 1992, p. 1). This is especially difficult in Roaded Natural and Semi-Primitive settings in the middle of the Recreation Opportunity Spectrum where the competing goals of providing safety and comfort while allowing challenge and adventure require provision of controls "obvious enough to afford a sense of security but subtle enough to leave the taste of adventure" (Sax, 1980, p. 100).

Typically, site modifications which entail significant fundamental alterations to the setting are deemed undesirable because they may undermine the very reasons people want to access them (PLAE, 1993). Beyond potentially

detrimental impacts to the site, as accessibility increases, challenge levels associated with outdoor recreation experiences decrease along with user satisfaction (Beechel, 1975). Additionally, many efforts to increase accessibility tend to diminish the sense of social integration for handicapped visitors (Sharpe, 1976). In some instances, trail reconstruction has established separate or special trail facilities for persons with disabilities - isolating them from the mainstream rather than establishing recreation environments structurally suited to meet the needs of the greatest number of users (Trails, 1990).

The Architectural and Transportation Barriers Compliance Board (ATBCB) began addressing the development of standards for outdoor recreation environments in 1993, but further developments in accessibility research are needed (PLAE, 1993). A need exists for research examining ways to enhance the inclusion of people with disabilities in outdoor recreation settings (Moore, 1996). The need for extrapolation or development of new criteria increases with progression from the Urban/Rural end of the spectrum of recreational opportunity settings toward Roaded Natural and beyond. Current guidelines establish only minimum requirements for accessibility and lack field-tested methods of implementation (PLAE, 1993).

General guidelines and principles associated with traditional nature or recreation trails include favoring areas that have observation opportunities with special features, differing seasonal experiences and conditions, natural contours in topography, safe and quick crossing of roads, and good trailhead access (U.S. Dept. of Agriculture Forest Service, 1985). These guidelines must be expanded to include specific consideration of increased accessibility and multiple-use needs. These additional considerations can be difficult to balance with the most

basic principle common to any trail, traditional or universally accessible, which states that "a well-located and designed trail reflects the mood and feeling of the area through which it traverses, and lies softly on the land" (U.S. Dept. of Agriculture Forest Service, 1981, p. 22).

Ensuring accessibility to the elements and spaces of an outdoor recreation site requires careful consideration of sustained running grade, maximum grade, cross slope, and surface material (Committee, 1994). Due to the barrier-free design required for wheelchair accessibility, which is the baseline for accommodation of other disabilities (PLAE, 1993), choice of surface material may be the most critical factor to overall accessibility. Hard-surfaced materials are more practical for multi-use trails. Some available hard surface types include granular (crushed) stone, asphalt, concrete, wood decking, and soil-cement (Conservancy, 1993).

In recreation settings, surface materials should be aesthetically appropriate (Committee, 1994), and in moderately developed (Roaded Natural) settings more rustic construction materials and natural-appearing surfaces are favored (PLAE, 1993). Interest in potential use of soil-cement for trail surfacing has been indicated by increased requests for information since passage of ADA (Adaska, 1997). However, there is little current literature to reference regarding this application (Prusinski, 1997). There has been little research on trail hardening techniques, and what has been done has produced mixed results (Gusey, 1991). Because there are distinct advantages and disadvantages with each surface material, choice and guidelines for use may vary depending on local conditions and construction practices (Committee, 1994).

Individual agency standards are applied with varying effectiveness. Despite the existence of Section 504 (1978) of the Rehabilitation Act of 1973, which mandates full access for people with disabilities in all federally conducted and funded activities, compliance has been inadequate with little increase in overall accessible trail mileage (Trails, 1990). This is, at least partially, due to the lack of a consolidated body of knowledge and a paucity of published material regarding accessible trail design and construction considerations. The development of universal design from a philosophical concept into a concrete, applicable design methodology awaits the interest and attention of design professionals (PLAE, 1993).

The Delphi Method

In many instances where decisions require knowledge which is not readily available, decision-makers must rely on the opinions of experts. The Delphi Method can be used when the primary source of information sought is informed judgment; where there is uncertainty on both the nature of the problem under investigation and the possible measures for addressing it effectively and efficiently (Ziglio, 1996). Delphi was the name of a meeting site in Ancient Greece where Oracles (people through whom a deity was believed to speak) met, held discussions, and gave wise or authoritative decisions or opinions. The modern day Delphi methodology has been widely accepted and applied in corporate planning and in the field of resource management (Crance, 1987).

Delphi evolved from a United States-Soviet nuclear-race-related research project at the Rand Corporation in the early 1950s into a widely used tool in corporate and social planning in the 1960s and 1970s (Kangas, 1998). The

Delphi can be used to set goals and priorities and to identify solutions to problems. It can also be used to clarify positions and delineate differences among diverse groups (Coyle, 1997). The Delphi process uses a series of questionnaires to aggregate the judgments and opinions from a selected group of experts who are knowledgeable about the issue under study (Schneider, 1993). This technique derives its importance from the realization that projections of future events, on which public policy decisions must rely, are based largely on the personal insight of informed individuals rather than on predictions derived from well-established current theory (Shafer, 1974).

A study done for the University of Texas Southwestern Medical School, Department of Internal Medicine which appeared in the May 1997 issue of the American Journal of Medicine (Coyle, 1997) utilized the Delphi as a key component in addressing the increasing need to train more primary care physicians in general internal medicine (GIM). A theoretically ideal work system was defined by a Delphi panel that consisted of the GIM division faculty, selected medical administrators, and pertinent literature (the surrogate expert) as respondent groups. These three respondent groups provided both internal and external viewpoints through three rounds to reach consensus on a vision of the ideal work system that would result in faculty turnover of less than 5% every two years. The process was evaluated as effective because: 1) it promoted group participation; 2) it promoted and processed a large flow of ideas; 3) it allowed faculty to successfully bring the task to closure; 4) it was structured and time-efficient; and 5) faculty felt a part of the planning process (Coyle, 1997).

The Delphi Method is an efficient, reliable, valid, and popular tool for collecting information for natural resource studies (Baughman, 1989). In recent

years, new applications of the Delphi have been presented in forestry (Anderson, 1993). In a study by Kangas (1998) published in Forest Science the Delphi was used not only as a means of quantifying expert judgments regarding future implications of alternative management plans for a managed boreal forest in Finland, it was also used to assess the effectiveness of the consensus process itself. Means and standard deviations of participants' interval scale ratings were studied along with a regression summary and a variance components model for the remaining lack of consistency to provide an assessment of how judgments changed from round to round. Group average priorities were provided to participants as feedback. It was concluded that the Delphi technique showed promise in the reduction of inconsistency among the judges (Kangas, 1998).

The Delphi process requires three separate groups to perform three different roles: 1) the decision-makers or experts who will receive and act on the product of the exercise; 2) a group (or person) who designs the questionnaires and summarizes the returns; and 3) a respondent group whose judgments are being sought (Turoff, 1970). There are two phases in virtually every use of the Delphi Method. They can be characterized as the exploration phase and the evaluation phase. During exploration, the subject under discussion is fully examined, and additional information is provided. Evaluation involves the gathering and assessing of the experts' views (Ziglio, 1996).

The primary characteristic of the Delphi Method is anonymity, and correspondence is the communication mode normally used (Crance, 1987). Innovations such as fax machines and electronic mail are now available to facilitate the Delphi process, replacing or substituting for traditional mail questionnaires (Ziglio, 1996). These innovations can have a tremendous impact

on minimizing some of the weaknesses of the Delphi Method. In particular, they can reduce the time-consuming activities involved in a Delphi process; improve facilities for including explicit procedures for synthesizing experts' contributions; and increase the opportunities for allowing side conversations among experts (Ziglio, 1996).

Size of the expert panel can be variable. The literature on this subject suggests that with a homogeneous group of experts, good results can be obtained even with small panels of 10 - 15 individuals. In situations where various reference groups are involved, the size of the sample may be considerably larger (Ziglio, 1996). Participants should be selected from a pool of eligible experts based on such factors as known viewpoint, background, and geographic location. Different perspectives may be represented by as many as 20 - 30 participants, or, where experts are deemed sufficiently knowledgeable about the breadth of the subject matter, and cross-perspective comparisons would not be meaningful, as few as six individuals per perspective may be sufficient (Goldschmidt, 1996). Experiments conducted in the 1950s and 1960s show there is a reduction in error with increasing group size (Delbecq, 1968). It should be noted, however, that above a certain threshold, including more and more individuals provides only marginal benefits to the distillation process of the Delphi Method (Dalkey and Helmer, 1963).

The merits of the Delphi Method can be summarized as follows:

it focuses attention directly on the issue under investigation; it provides a framework within which individuals with diverse backgrounds or in remote locations can work together on the same problem; it minimizes the tendency to follow-the-leader and other psychological and professional

> barriers to communication; it provides an equal opportunity for all experts involved in the process; and it produces precise documented records of the distillation process through which informed judgment has been achieved (Ziglio, 1996, p. 22).

Concerns about the validity of results arrived at through the Delphi process are common to any form of exchange of information, but, if properly conducted, the Delphi Method usually generates a better outcome than traditional face-to-face interactive communication (Ziglio, 1996).

Evaluation

Expert opinion often dictates agency policy and procedures. Ultimately, however, the measure of the merit of these opinions often rests in the hands of the general public. It can be helpful to assess such opinions before they are implemented on a broad scale. Evaluating expert opinion can be challenging when it deals with complex technical issues and concepts that may not be widely known. It may be particularly effective to utilize evaluative methods that permit quantification of qualitative dynamics. Quantitative data deals with numbers, qualitative data deals with meanings, and meaning is essentially a matter of making distinctions (Dey, 1993). One method of delineating or measuring social distinctions is through the use of surveys, especially those which utilize Likert scales (Langley, 1970). Surveys are used for gathering descriptive data, for making inferences to populations, and for building blocks of social theory (Converse, 1987). The Likert scale is one of the best known techniques for achieving ordinal measurement of qualities of interest to social research. Featuring summed responses to a set of items, each of which permits the

respondent to locate himself on a five-point scale, this simple scoring system gives results equivalent to scoring systems based on much more complicated assumptions (Weiss, 1968). The scarcity of timely secondary data relating directly to the recreation/leisure industry and its customers often necessitates the use of survey research in the acquisition of suitable data (Dikeman, 1983). The primary reason that outdoor recreation surveys are carried out is to provide a basis for forecasts or predictions which can then be employed in planning and management activities (Burton, 1983).

METHODS

The study was conducted in five phases: 1) literature search, informal communication and consultation; 2) planning and construction of a universally accessible nature trail (the Stephen F. Austin Interpretive Trail), referred to hereafter as the SFA Trail; 3) statement of the design and construction principles utilized and/or developed on the SFA Trail project; 4) organization and orchestration of a nationwide Delphi panel to assess and define the current state of expert opinion about principles of design and construction for universally accessible nature trails; and, finally, 5) trail users' evaluation of the SFA Trail, the principles developed and implemented on the SFA Trail, and the principles developed by the Delphi panel.

Study Area

A portion of the study involved visitors to the SFA Trail on the Stephen F. Austin Experimental Forest (SFAEF). SFAEF is a 2,560 acre tract on the Angelina National Forest. It is located approximately ten miles southwest of Nacogdoches, Texas on FM 2782 between State Highway 7 and U.S. Highway 59 (Figure 1).

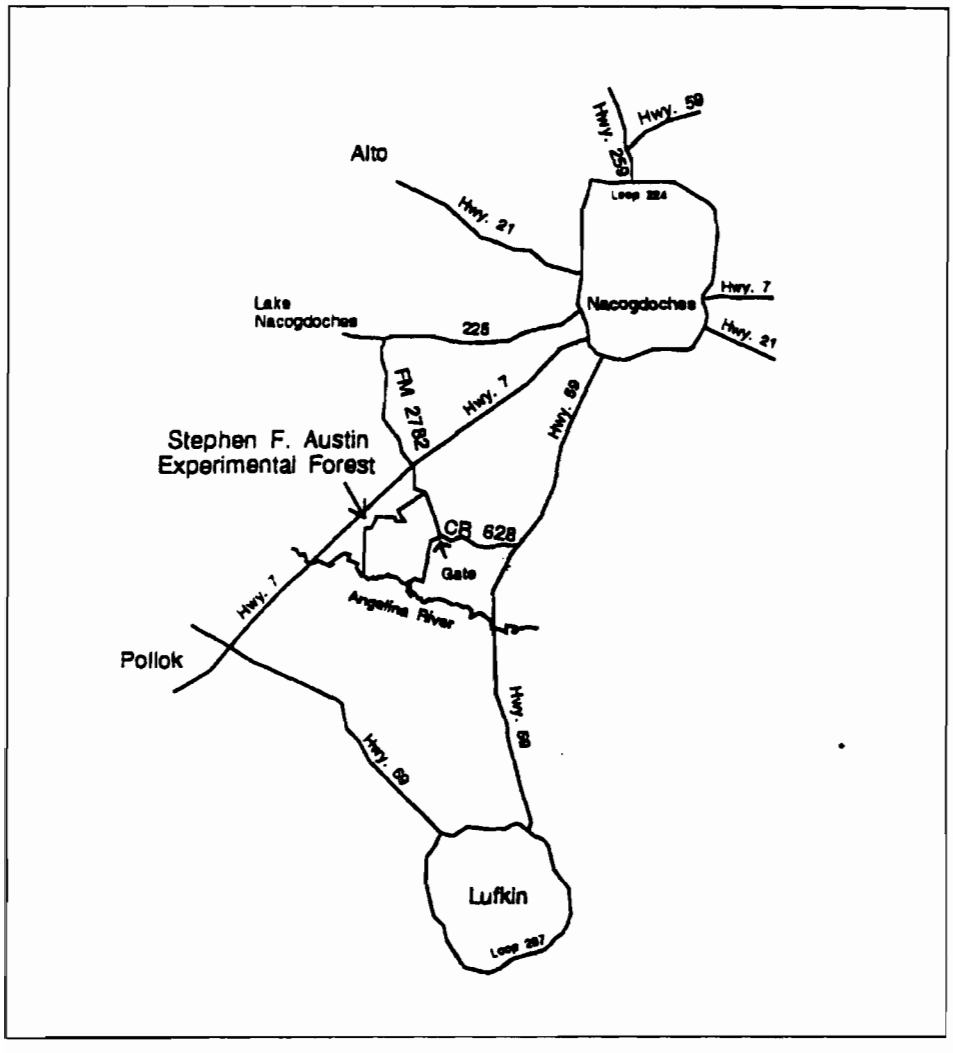

Figure 1. Stephen F. Austin Experimental Forest Location Map

The Forest consists of 17 separate units with approximately 1,800 acres of mature bottomland hardwood forest. The remainder is pine and mixed pine/hardwood forest. Purchased by the U. S. Government in 1939, assigned to the U.S. Forest Service (USFS) in 1944, and designated part of the Angelina National Forest in 1945, SFAEF is one of 12 experimental forests run by the

Southern Research Station. It is administered by the USFS through the Wildlife Habitat and Silviculture Laboratory in Nacogdoches, Texas.

The Stephen F. Austin Interpretive Trail system traverses six different management units on the Forest. It features two loops in a figure eight (Figure 2).

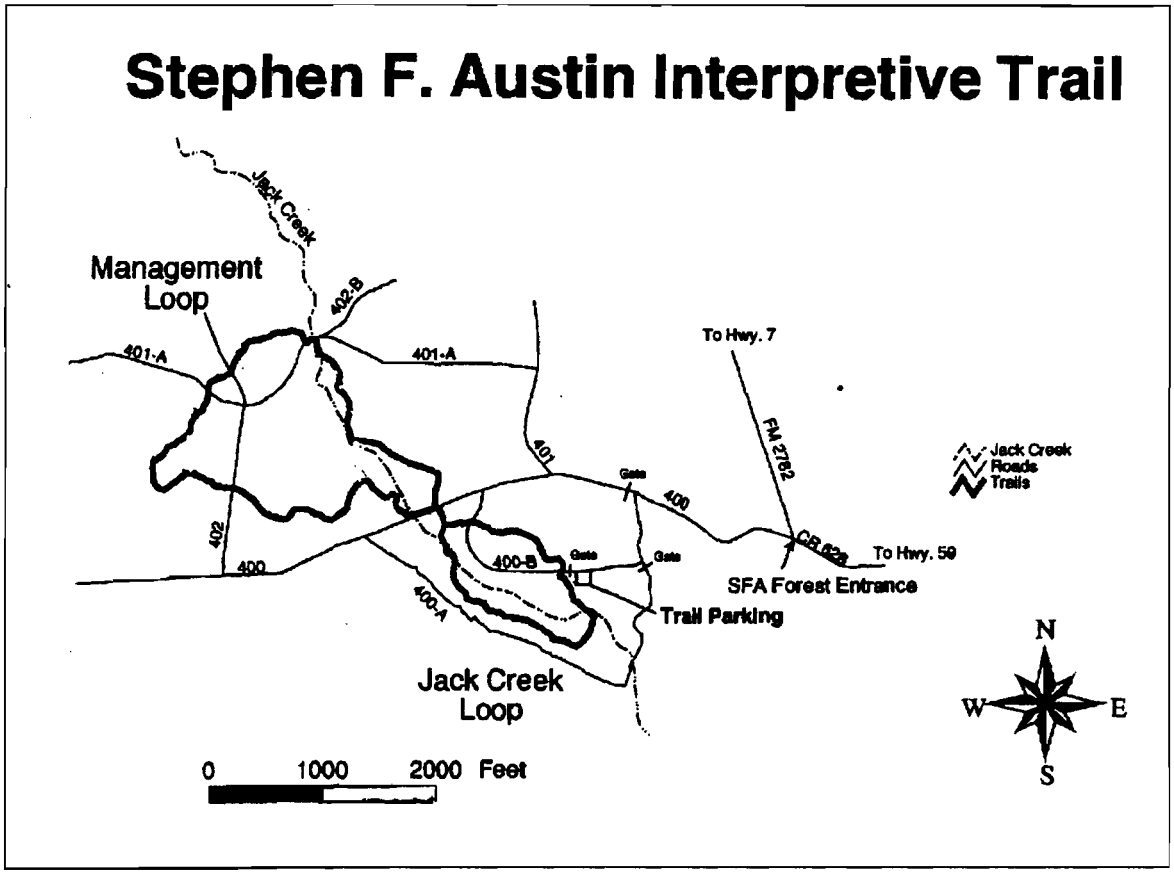

Figure 2. Stephen F. Austin Interpretive Trail System Map

One of these, 1.5 miles long, passes through five management units. This loop (the Management Loop) provides experiential learning opportunities in the field where forest ecosystems, wildlife habitats, forest management,

succession, and the effects of silvicultural treatments can be observed over the course of time.

Figure 2a. The SFA Interpretive Trail, Jack Creek Loop offers universal access to a rare mature mixed forest. ***Photo by S. Kirkindall, 1998.***

A second loop (the Jack Creek Loop), 0.9 miles in length, has objectives consistent with traditional recreational nature trails, but with the additional feature of universal accessibility (Figure 3).

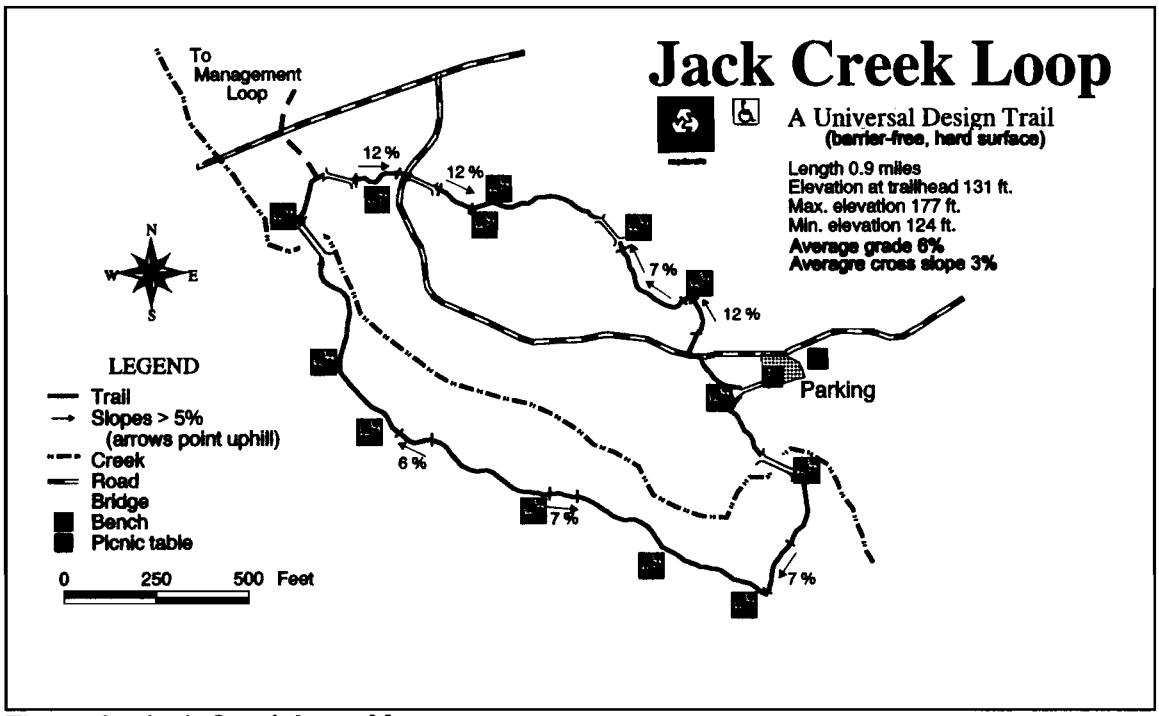

Figure 3. Jack Creek Loop Map

This loop and its specific planning, design, and construction considerations were evaluated by trail users. The principles developed and utilized in its creation as well as the principles developed by an expert panel through the Delphi Method were also evaluated by these same trail users.

Survey Participants

Announcements explaining the basic objectives of the study along with an invitation to participate, a map with directions to the trail, and a trail brochure were mailed or hand-delivered to more than 200 local and regional facilities, groups, agencies, organizations, and individuals with potential interest in outdoor recreation, nature study, and/or disability access issues. Invitees included environmental groups, nature study groups, cross-country runners, hikers, health-walkers, assis[illegible] centers, nursing homes, physical rehabilitation centers, disa[illegible] roups, disabled [illegible], r[illegible]anagement undergraduate students, human resource gra[illegible]e students, and numerous individuals with and without disabilities. [illegible]ipation was also solicited from persons visiting the trail on their own initiative. A total of 108 visitors were surveyed during the study period, October and November 1998.

Procedures

Exploration

A literature search revealed a paucity of published information on universally accessible trail design and construction. Two references (Veverka) and (Beechel) dating from the 1970s were found which addressed issues associated with disabilities and trails. Both dealt more with disability interpretive concerns, social dynamics, and interpersonal communication strategies for resource managers and staff than with specific design considerations. One paper on trail hardening (Gusey) published in 1991 presented some inconclusive

results on trail surface materials. *Universal Access to Outdoor Recreation* and *Recommendations for Accessibility Guidelines: Recreational Facilities and Outdoor Developed Areas*, published in 1993 and 1994, respectively, both addressed accessibility on trails as just one component of outdoor recreation access. Both focused on suggested dimensions and measurement requirements, but neither dealt with specific implementation techniques and strategies.

Efforts were made to contact, interview, and compile information from resource managers and recreation design specialists. Those contacted included landscape architects, engineers, recreation specialists, and trail coordinators representing local, state, and federal agencies as well as private and non-profit organizations. A nationwide networking effort produced a number of people working on regulatory issues (standardization of rules and requirements), numerous people in administrative positions responsible for administering trails, several people with experience as accessibility consultants, but only a few people who had participated in some capacity on development of at least one accessible trail project. The lack of knowledge or experience with accessibility issues in less developed recreation sites and the absence of familiarity with the concept of universal design among those in position to implement and administer such improvements gave impetus to the justification and need for this study.

Planning and Construction of the SFA Trail

Between October 1992 and October 1997, planning, layout, design, and construction of the SFA Trail was coordinated and executed under the supervision of the U.S. Forest Service. Initially, consideration was given to the general objectives in the Forest Plan including the Forest environmental impact

statement, interaction of resource activities, opportunities present, and constraints of the area. A review of existing regional recreational facilities was conducted to determine whether the location, design, and expected use of the trail justified its construction. Design elements included consideration of the trail within the context of a logical land unit as well as specific trail objectives and associated management requirements.

Reconnaissance began with a review of topographic maps of the Forest, maps delineating management unit boundaries, and the Forest Management Plan. Prospective areas were selected based on maximizing variety as well as optimizing exposure of the visual resource. Potential construction, maintenance, and other management concerns associated with each prospective site were also considered. After identifying several possible areas, on-site inspections were made. Final selection of the site was made according to best possible match of objectives and constraints with the location and physical character of the proposed site.

Once the area had been selected, route investigation was conducted by thorough on-site exploration of the entire area. The preferred route was marked by preliminary flag lines. A complete environmental assessment was then conducted along the flagged route. The proposed route had to comply with all standards and constraints as determined by archaeological, wildlife, silvicultural, landscaping, engineering, recreational, and ADA assessments conducted by the U.S. Forest Service. Adjustments were made in the route to satisfy all assessment requirements. A grid map showing the placement of this route was then prepared.

A design narrative was written and submitted for approval by all appropriate departments and responsible personnel. This document explained the purpose, objectives, and justification for the project. It included a general description of the location and design, the physical environment, and operational considerations. It also included design guidelines for all structures describing the architectural character and types of materials to be used. Drawings with all structure specifications accompanied the guidelines. The design narrative included a detailed trail map as well as time and cost estimates, a monitoring plan, and provisions for maintenance.

Once the design narrative was approved, the contract specifying financial obligations and performance responsibilities of cooperating organizations was signed, and all approvals were obtained, preparations were made to begin construction. Agreements and arrangements were made with cooperators for the loan and use of heavy equipment, materials and tools were purchased, and a crew consisting entirely of university students was hired. The planning and design process took place between September 1992 and September 1994. Beginning in October 1994, construction of the Management Loop of the trail system was undertaken first and required a year to complete. Clearing began for the universally accessible Jack Creek Loop in October 1995. Construction was completed and the trail opened for public use in October 1997.

Statement of SFA Trail Design Principles

The objectives outlined in the introduction were defined and applied at the outset of planning and were adhered to throughout the design and construction process. The underlying goal in every aspect of project implementation was to maximize practical functionality while minimizing the appearance of site

modifications and the visibility of accessible accommodations. The single exception (to visibility) pertained to signage and paint striping marking reserved accessible spaces in the parking area. Otherwise, the intention was to make no apparent distinctions between accessible features and any other design element.

With regard to accessibility, two major areas of design concern were addressed. These were the selection of the trail surface material and concerns about topographic variation including slope and cross-slope mitigation. Primary consideration was given to the choice of a material for the barrier-free surface. Soil-cement was selected for a number of reasons. Its natural appearance makes it an attractive alternative to other surface materials (Gusey, 1991). It also has the textural character to provide good traction (wet or dry) and a proven history of durability in other applications (Farny, 1995). The relatively low cost of materials and the ability to mix in place, which protected the site from heavy truck and equipment traffic and permitted custom application according to site features, also supported the use of soil-cement for the trail surface.

Topographic variation was included in the trail route not only for aesthetic reasons but to provide a range of challenge levels for all users. Out-sloping was kept to a minimum to permit at-grade water drainage without creating a cross-slope difficulty. Instead of making significant grade alterations, where possible, slopes were mitigated through strategically placed plateaus, the location of rest stations, and use of modified switchbacks. In the most problematic areas, where grades and cross-slope combined exceeded maximum standards, retaining walls and fill were utilized.

While mandated trail design standards are yet to be definitively established, guidelines exist and were used as parameters (Appendix B). These

guidelines were adapted from architectural standards and are expected to be less restrictive once applications for outdoor settings are determined. Nonetheless, all design elements of the SFA Trail were specifically tailored to fit well within the current maximum allowable limits of a moderate difficulty rating. Therefore, it is anticipated that the SFA Trail will comply with mandated standards as they evolve.

The guidelines developed and utilized during the planning, design, and construction of the SFA Trail were stated as principles (see Table 7). These principles not only reflect the spirit of the universal design concept, the commitment to preserve site integrity, and respect for the recreation experience, they also define the specific applications employed to achieve those ideals.

The Delphi Process

The Delphi panel (Appendix C) was given the task of developing and refining principles with the same planning and design objectives used in the development of the principles employed in the design and construction of the SFA Trail. The panel was asked to create guidelines for the practical application of ADA criteria that could be used to provide universal accessibility on nature trails in non-urban settings while:

A. minimizing social as well as physical barriers for users with disabilities
B. minimizing creation of aesthetic barriers
C. preserving and protecting the integrity of the resource.

Panel participation was solicited from individuals who have published books, articles, and/or reports on accessibility and outdoor recreation, or who have served on nationally prominent boards, committees, or other accessibility

advocacy forums. Suggestions and referrals to other individuals who have administered, planned, or constructed accessible trail facilities were solicited. Letters generally explaining the focus and scope of the research were sent to more than 50 individuals. Those who responded were given more detailed information regarding specific study objectives and methods. Twenty panelists were initially selected based on evaluation of their biographical information and overviews of their interest areas and involvement with accessibility issues as well as their willingness to participate. Due to attrition, 12 of the 20 respondents formed the final Delphi Panel (see Appendix C).

The Delphi Method was conducted in four rounds. The focus of the first round was identification and explanation of issues and concerns. Rounds two and three were dedicated to challenging, defending, amending, clarifying and refining those issues, as well as introducing additional issues. The fourth round provided opportunities to accept or reject the results of the previous rounds as well as to rank order by significance those results. Final approval was by unanimous consensus. Panelists worked individually and anonymously. Panelists were given information that included a study overview (including objectives and parameters), general information, definitions, instructions, and examples (Appendix D). Pre-formatted response forms were provided to panelists along with self-addressed, stamped return envelopes. Time limits of ten days were allowed for panelists to read, deliberate, and complete each round. All information supplied by panelists in all rounds was compiled, edited, combined, and disseminated by the researcher.

In conducting the Delphi process, the researcher's primary function was to define the parameters of the study and ultimately to facilitate consensus among

panel members. When more than one point of view was expressed on an issue, similar ideas were consolidated, but disparate opinions were listed separately. Conscientious effort was made to use the exact words of panelists when combining comments or opinions.

Round I consisted of two different components. The first, a trouble-shooting section, requested panelists to describe specific problems encountered in their experiences with accessible trail projects along with explanations of strategies employed to address those problems. They were also asked to rate the effectiveness of these strategies and make any suggestions they might deem helpful for future reference. Additionally, they were asked to list useful references and sources of information.

The second component of Round I dealt with issues and concerns associated with extending accessibility into less developed outdoor recreation sites. An open-ended format was utilized to avoid narrowing or restricting the field of potential topics for discussion. Panelists were encouraged to state any and all issues deemed relevant to the study objectives. Space was provided to list specific concerns associated with each issue. Panelists were then asked to provide a brief explanation of their concerns along with an opinion about what could or should be done to address these concerns. Finally, panelists were asked to provide specific examples to demonstrate potential applications of their recommendations.

In Round II, all issues, related concerns, and opinions listed in Round I were presented to the panel for assessment. In addition, the panel was asked to add any issues brought to mind since Round I. A list of additional issues not addressed in Round I was also suggested by the researcher for consideration

(see Appendix D). Panelists were asked to express their level of agreement (or disagreement) with each opinion by marking a point on an agreement continuum scale. Space for comments was provided to support a position, explain disagreement, or suggest revisions.

In the third round, opinions originally expressed in Round I were revised to reflect the comments and suggestions submitted in Round II and returned to panelists along with new issues which were raised in the second round. They were asked to assess their level of agreement and comment on each issue. With the exception of excluding the request for new issues, the third round utilized the same instructions, format, and objectives as Round II.

In Round IV, the opinions developed through the previous three rounds were stated as 37 separate principles. Panelists were asked to approve (or reject) each principle and assign a level of significance to each by marking a point on a significance continuum scale. To encourage serious consideration of each principle and promote consensus of opinion, panelists were told that only those principles that were unanimously approved would be included as results of the Delphi process so that a single vote to exclude any principle would result in its rejection.

Trail and Principles Evaluation

Three separate survey questionnaires (Trail User Information, Principles Evaluation, and Trail Evaluation forms) (Appendix E) were developed for use in the study. All survey instruments were submitted to the graduate committee (Appendix F) for review prior to use with trail visitors. Each study participant provided demographic characteristics by completing a personal information form. Principles developed as part of the SFA Trail project were combined with those

generated by the Delphi panel and presented to trail visitors on a Principles Evaluation Form. A total of 59 principles grouped into eight different categories were evaluated through use of five-point Likert scales. Participants were asked to rate their level of agreement with each stated principle as well as their opinion about its degree of importance. This aspect of the study focused on what trail visitors thought were the most important principles.

Additionally, these same participants were asked to complete a 36-item questionnaire evaluation of the SFA Trail to determine if design objectives had been met and whether the design of the SFA Trail met visitors' needs, expectations, and preferences for a nature trail. This questionnaire utilized the same format of grouping items into categories and calling for a two-part, five-point Likert scale response of agreement and importance to each item. All questionnaires were handed to trail visitors after they had completed a trip around the accessible loop of the SFA Trail. Visitors completed the questionnaires and returned them on site.

Analyses

Data analyses were performed with Statistical Package for the Social Sciences (SPSS) for Windows. SPSS was used for its strength in analyzing survey data containing missing values. Procedures included the usual descriptive statistics, simple frequency distributions, cross-tabulations with gamma, and one-way analysis of variance. Dependent variables included the 59 design principles and the 36 descriptive statements about the SFA Trail. The independent variable in all considerations was the disability concerns status of participants.

The data were analyzed for frequency to determine response distributions and demographic characteristics. Three different levels of ability/disability status were grouped into two categories. Participants with disabilities and those who had significant others with disabilities were grouped together as having disability concerns. Those who had neither disabilities themselves nor significant others with disabilities were described as having no disability concerns. One-way ANOVAs were used to detect significance of disability concerns status on opinions and preferences. All ANOVAs were conducted at the 0.05 level of significance. Because the data were not normally distributed, factor analysis and principle component analysis could not be used. Gamma statistics were computed for each principle because the gamma statistic does not assume normality of data distribution.

The gamma statistic is a measure of association for ordinal variables and ranges from -1.0 to +1.0. For simplicity's sake, it might be compared to a squared correlation coefficient (Hendee et al., 1968). The absolute value of gamma is a proportional reduction in error (P-R-E) measure that may be interpreted as the difference between the conditional probabilities of like and unlike order, given no ties (Costner, 1965). It indicates the degree to which prediction errors can be reduced by virtue of the association between the two variables being considered (Hendee et al., 1968).

Gamma uses the information about the ordering of categories of variables by considering every possible pair of cases in the table. Each pair is checked to see if its relative ordering on the first variable is the same (concordant) as their relative ordering on the second variable or if the ordering is reversed (discordant) (Nie, 1975).

Where (P) = the number of concordant pairs and (Q) = the number of discordant pairs, the formula for gamma is:

$$\text{Gamma} = \frac{P - Q}{P + Q}$$

Gamma was used here as a means of data reduction, that is to reduce the number of principles to those with the higher gamma values; the higher the gamma, the more highly associated the variables. Gamma was used similarly as a statistical measure of association in the development of Hendee's Wildernism (sic) Scale where a minimum gamma level of 0.50 reduced 60 items to 30 on the testing instrument (Hendee et al., 1968). A minimum gamma of 0.70 was used to reduce 33 statements to 17 for a Wilderness Area Management Scale in a 1986 study of university student knowledge levels concerning resource management issues (Cathey, 1986). In this case, the minimum acceptable gamma was set at 0.50 for the principles developed by the Delphi panel. To provide a more stringent measure of association for the more numerous Kirkindall principles, the minimum acceptable gamma was set at 0.60.

RESULTS AND DISCUSSION

Characteristics of Survey Participants

A total of 108 trail visitors were surveyed on site during the months of October and November, 1998. All 108 participating trail visitors completed the Trail User Information form and the SFA Trail Evaluation form. Seventy-nine of those also completed the Principles Evaluation Form (see Appendix E). Descriptive characteristics of participants were collected to determine if demographic variables such as age, gender, ethnicity, or disability status might explain differences in responses among or between groups. Because sample size was prohibitively small, comparisons were limited to demographic variables relating to disability concerns status which was the characteristic of primary concern.

Of the 79 who completed the Principles Evaluation questionnaire (Table 1), 20 (25.3%) individuals reported having some sort of disability themselves while 22 (27.8%) claimed to have a significant other with a disability, comprising a combined 53.1%. This total was adjusted to 38 (48.1%), because two individuals with disabilities also reported having significant others with disabilities and were counted in both groups. Forty-one (51.9%) reported having neither disabilities themselves nor significant others with disabilities.

Table 1. Descriptive Characteristics of Trail Visitors Who Evaluated Design Principles for Accessible Nature Trails. n = 79

Characteristic	Demographic Categories					
	A	B	C	D	E	F
Age	19 & under n = 4 5.1%	20-34 n = 36 45.6%	35-49 n = 18 21.3%	50-64 n = 12 15.2%	65-79 n = 7 8.9%	80 & over n = 2 2.5%
Gender	Male n = 41 51.9%	Female n = 38 48.1%				
Ethnicity	African American n = 1 1.3%	Caucasian n = 76 96.2%	Hispanic n = 1 1.3%	Native American n = 1 1.3%		
Disability Status	No Disability Concerns n = 41 51.9%	Disability Self n = 20 25.3%	Significant Other with Disability n = 22 27.8%	Disability Concerns (B + C) n = 38* 48.1%		

*total corrected for duplicated respondents

Forty-one (51.9%) were males and 38 (48.1%) were females. Only two (2.5%) were aged 80 or older with four (5.1%) being 19 or younger. Twelve (15.2%) ranged in age from 50 - 64. Eighteen (22.8%) were in the 35 - 49 age group while the 20 - 34 age group was the most heavily represented with 36 (45.6%). Caucasians, by far, represented the vast majority of those completing the evaluation with 76 (96.2%). The rest of the sample was comprised of one African American, one Native American, and one Hispanic (1.3% each).

Of the 108 who completed the Trail Evaluation questionnaire (Table 2), 24 (22.2%) individuals reported having some sort of disability themselves while 28 (25.9%) claimed to have a significant other with a disability, comprising a combined 48.1%. When adjusted to account for respondent duplication, the

combined disability-concerns group totaled 48 (44.4%). Sixty (55.5%) reported having neither disabilities themselves nor significant others with disabilities.

Table 2. Descriptive Characteristics of Trail Visitors Who Evaluated the Stephen F. Austin Interpretive Trail. n = 108

	Demographic Categories					
Characteristic	A	B	C	D	E	F
Age	19 & under n = 7 6.5%	20 - 34 n = 47 43.5%	35 - 49 n = 23 21.3%	50 - 64 n = 19 17.6%	65 - 79 n = 10 9.3%	80 & over n = 2 1.9%
Gender	Male n = 57 52.8%	Female n = 51 47.2%				
Ethnicity	African American n = 1 .9%	Caucasian n = 76 93.5%	Hispanic n = 1 1.9%	Native American n = 1 .9%	Other n = 3 2.8%	
Disability Status	No Disability Concerns n = 60 55.6%	Disability Self n = 24 22.2%	Significant Other with Disability n = 28 25.9%	Disability Concerns (B + C) n = 48* 44.4%		

*total corrected for respondent duplications

Fifty-seven (52.8%) were males and 51 (47.2%) were females. Only two (1.9%) were aged 80 or older with seven (6.5%) being 19 or younger. Nineteen (17.6%) ranged in age from 50 - 64. Twenty three (21.3%) were in the 35 - 49 age group while the 20 - 34 age group was the most heavily represented with 47 (43.5%). Caucasians, by far, represented the vast majority of those completing the evaluation with 101 (93.5%). The rest of the sample was comprised of one African American and one Native American (0.9% each), two Hispanic (1.9%), and three "other" ethnic groups (2.8%).

Principles Developed by the Delphi Panel

The Delphi panel operated between May, 1998 and August, 1998. The majority of panelists were more experienced in administrative capacities than in applied design and construction efforts. This orientation is reflected in the emphasis on "Planning" principles. Seven of the panel's first ten principles address planning issues. The effects of bureaucratic experience may also be reflected by the panel's emphasis on the need for communication at all levels of involvement with trail projects.

Through the initial three rounds, the panel produced 37 principles. Nineteen were eliminated in the fourth round, but only four of the 20 most highly ranked principles were eliminated. The result was a list of 18 non-controversial, dissent-free principles which represent the principles deemed most important by the panel. The panel's final 18 principles, rank-ordered by descending mean scores of panelists, are listed in Table 3.

Table 3. Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Panelists. n = 12

	Descriptive Statistics			
Principle	Rank	Mean	Std. Dev.	n
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations. (Planning)	1	4.92	0.29	12
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designers, and resource managers. (Planning)	2	4.83	0.39	12
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment. (Planning)	3	4.67	0.89	12

Table 3. Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Panelists. n = 12

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal. (Surface)	5	4.58	0.69	12
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site. (Design)	6	4.50	0.52	12
There should be no minimum or maximum lengths for accessible trails. (Design)	7	4.33	0.65	12
Planning and design needs to evolve with input from all user populations. (Planning)	8	4.33	0.79	12
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail. (Planning)	9	4.33	0.89	12
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors. (Planning)	10	4.33	0.98	12
Interpretive planning should incorporate tactile and auditory options. (Planning)	11	4.25	0.62	12
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project. (Planning)	12	4.25	0.87	12
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices. (Planning)	13	4.25	0.97	12
Benches and rest stations are a critical element of trail design. (Structures)	14	4.08	1.00	12
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes. (Topography)	15	4.0	0.74	12

Table 3. Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Panelists. n = 12

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads. (Signs and brochures)	16	4.0	1.04	12
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material. (Parking)	17	3.75	0.75	12
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability. (Surface)	18	3.75	1.06	12

maximum possible mean = 5.0

Ten of the panel's 18 principles fall into the "Planning" category. Two appear in "Design", two in "Surface", and one each in "Parking", "Topography", and "Structures." The panel was unable to reach a consensus on "Safety" issues, and therefore had none in that category. The two most highly ranked principles showed the highest homogeneity among panelists. With standard deviations of 0.29 and 0.39 respectively, panelists were largely in agreement that "Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations," and that "Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers." Beyond consensus on these two principles, with standard deviations ranging from 0.52 to 1.06 on the remaining 16 principles, there was considerably more variation among responses.

Of the original 37 principles, a total of 19 were rejected by the panel in the fourth and final round. Reasons for rejection included objections to the breadth

of the scope (both too broad and too narrow) of some principles and reversal of position of some panelists regarding their own earlier opinions. It should be noted that 12 of these 19 were eliminated by only one vote (see Table A-1). Three others were rejected by as many as three votes, and another four received two votes to exclude.

Frequency Distribution of Visitor Importance Ratings of the Delphi Panel's Principles

Visitors rated the importance of principles on a five-point scale in ascending order from "not at all important," "not very important", "somewhat important," and "very important," to "one of the most important." The frequency and distribution of visitor importance ratings of the Delphi panel's principles are listed in Table A-2. Responses were not normally distributed. Only two of the 18 statements received any "not at all important" ratings: "Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices" and "Trail design should provide opportunities for visitors to make 'hands-on' connections with the elements of a site" each received one "not at all important" rating. In most other instances, between 50% and 90% of all responses to each principle fell into the "very important" and "one of the most important" columns. Clearly, the most important issue according to trail visitors, was the principle dealing with the characteristics and appearance of trail surface material. More than 91% of all responses to that principle were in the "very important" and "one of the most important" columns.

One-way ANOVA Results for Delphi Panel Principles by Visitor Disability Concerns Status

There were four cases in which significant ($p < 0.05$) differences occurred between how the two groups perceived the importance of the Delphi panel's principles (Table 4). In all four instances, means were higher and standard deviations were lower among the disability-concerns group (Figure 4). In fact, individuals who had disabilities or significant others with disabilities consistently ranked the importance of most principles slightly higher than individuals with no disability concerns. There also tended to be more homogeneity of responses among the disability-concerns group as 15 of 18 principles had lower standard deviation values in this group (see Table A-3). A notable exception was on the principle dealing with "hands-on" connection opportunities, which had a higher mean score (3.90 vs. 3.87) among those with no disability concerns. With the highest standard deviation (1.04) of the entire table, there was broad disagreement among the disability-concerns group on this issue. Though this was not statistically significant, it is interesting in that another principle dealing with tactile and auditory interpretive options was one of the four principles with a significant difference between the two groups, which were all ranked higher in importance by the disability-concerns group.

Table 4. One-way ANOVA Results for Delphi Panel Principles with Significant Differences ($p < 0.05$) by Visitor Disability Concerns Status. n = 79

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.				
Disability Concerns	38	4.58	.60	
No Disability Concerns	41	4.22	.82	.030
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.				
Disability Concerns	38	4.26	.72	
No Disability Concerns	41	3.63	.94	.001
Interpretive planning should incorporate tactile and auditory options.				
Disability Concerns	37	3.97	.76	
No Disability Concerns	39	3.59	.88	.047
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.				
Disability Concerns	38	4.68	.53	
No Disability Concerns	41	4.29	.72	.007

$\alpha < 0.05$

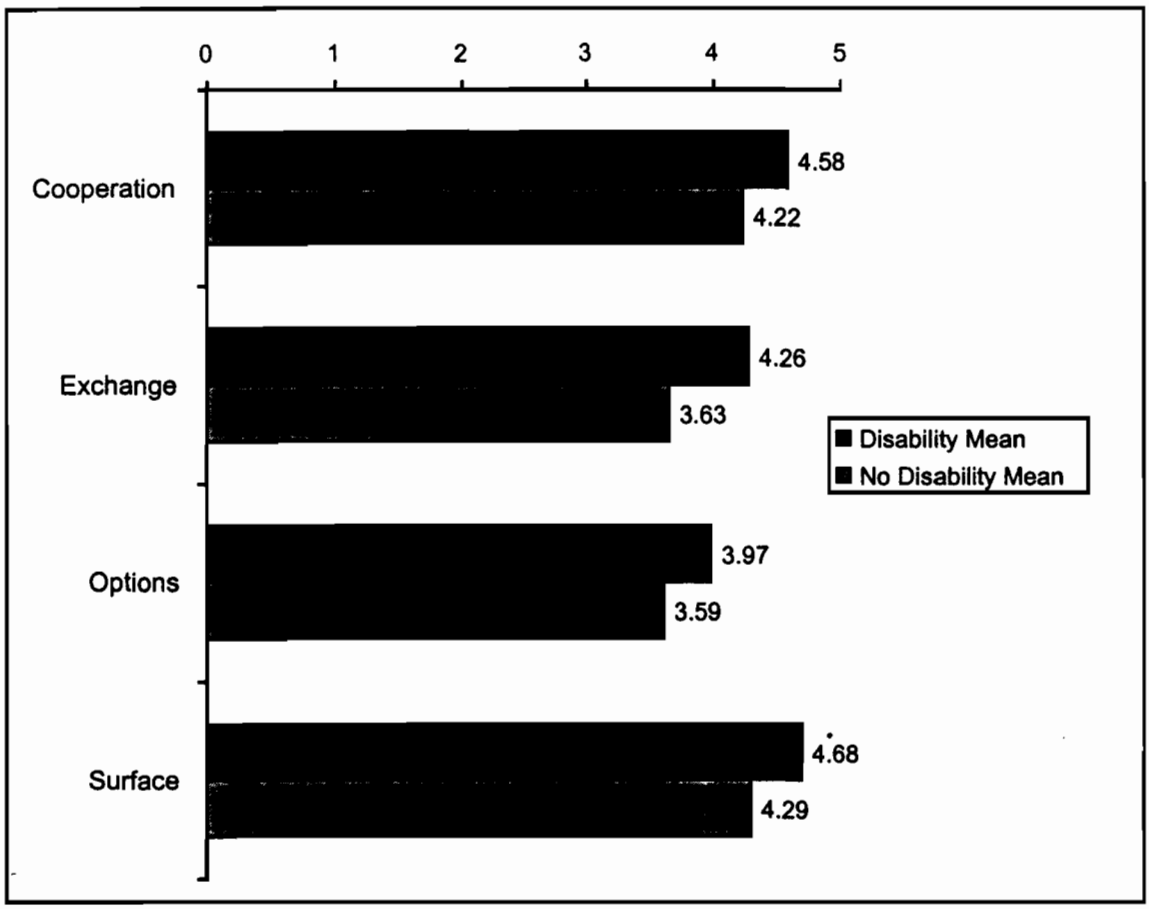

Figure 4. Means of Delphi panel principles with significant differences ($p < 0.05$) by disability concerns status.

One principle, addressing the appropriateness of tactile and auditory options, had, in the disability-concerns group, a mean score of 3.97 while those with no disability concerns had a mean score of 3.59 (significance value of .047). Two of the other three principles with significantly different responses between the groups were concerned with communication issues. "Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project" had mean scores of 4.58 and 4.22, (significance value of .030). "Planners, designers, and resource managers have a responsibility to facilitate the

exchange of information and ideas with consumers and lay advisors" had mean scores of 4.26 and 3.63 with a significance value of .001. The only other principle with a significant difference in mean scores dealt with trail surface material. While virtually everyone recognized the importance of trail surface, those with disability concerns rated surface material issues more important with a mean score of 4.68 vs. 4.29 and a significance value of .007.

Not surprisingly, these results indicate that people with disability concerns perceived as more important than did people without disability concerns many issues which pertain to improved accessibility on nature trails, including some accommodations for hearing- and sight-impaired visitors as well as for those with mobility impairments. This group also had much less variability among responses. People with disabilities may be more sensitive to accessibility issues because in many cases, without attention to these details, their outdoor recreation experiences are restricted. Perhaps of more interest to resource managers is that people with disability concerns appear to indicate more of an interest in being involved in the trail planning process and that they have a higher level of expectation regarding the responsibility of resource managers to include consumers and lay advisors in that process than do people with no disability concerns.

Delphi Panel Principles Rank-Ordered by Mean Scores of Trail Visitors

The order in which participants ranked the importance of the Delphi panel's principles revealed that three of the four principles that evoked statistically significant different importance ratings between the two groups appear in the top five overall ranking (Table 5). The fourth appears near the

bottom of the importance scale (Table A-4). Even though the group with disability concerns had consistently higher importance ratings, and there were the four principles which were rated significantly lower by the other group, both groups tended to agree generally on the order of importance for the panel's 18 principles.

Table 5. Top Five Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

	Descriptive Statistics			
Principle	Rank	Mean	Std. Dev.	n
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	1	4.48	.66	79
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	2	4.42	.73	79
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	3	4.41	.67	79
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	4	4.39	.74	79
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	5	4.29	.79	78

maximum possible mean = 5.0

"Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal" was the principle with the highest mean; however, the only other principle dealing with trail surface material issues was rated next to last in order of importance. This principle dealt with experimental alternative surface materials,

indicating an apparent contradiction in that trail surface was seen as the most important issue in the opinion of study participants, yet they did not find it important to explore the various suggested surface material options.

After trail surface, the next four most important principles all dealt with attitudes, perspectives, and cooperativeness of trail planners, designers, and resource managers. This may suggest that survey participants perceive designers' mindset, cooperativeness, and willingness to communicate more important than the mechanics and logistics of trail design.

Gamma Statistics for Delphi Panel Principles

Gamma statistics for the 18 principles developed by the Delphi panel ranged from 0.240 to 0.722 (Table A-5). With the minimum acceptable gamma set at 0.50, the number of principles developed by the Delphi panel was reduced from 18 to the most highly associated 13 (Table 6).

Table 6. Gamma Statistics for the 13 Most Highly Associated Delphi Panel Principles. n = 63

Principle	Gamma Statistic
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	.722
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	.680
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	.666
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	.657
Planning and design needs to evolve with input from all user populations.	.655
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	.655
Interpretive planning should incorporate tactile and auditory options.	.612
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	.597
Benches and rest stations are a critical element of trail design.	.559
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	.556
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	.523
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	.506
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	.506

minimum acceptable gamma = 0.50

Among these 13, nine were "Planning" principles, while one each occurred in the "Parking", "Structures", "Surface", and "Topography" categories. Principles with the fourth, sixth, and eighth highest gamma values were the three principles expressed by both Kirkindall and the Delphi panel.

Two major ideas are shared among these 13 principles. First, as many as nine principles emphasize the importance of planners providing a variety of design options to accommodate disabled visitors without creating separate trails. These range from trail choices, structures, and trail surface material to parking accessibility, and interpretive options. Second, four principles address the importance of communication and cooperation between all parties involved in all phases of a trail project. The most highly associated principles indicate that people generally expect managers to provide accessible trail accommodations with cooperation and input from all parties involved.

Kirkindall Principles Ordered by Category

During the five years the SFA Trail was being developed, a number of principles, incorporated at the outset of the project, served as guidelines for all planning, design, and construction activities. Others evolved during the construction process and were included on the visitor survey. The majority of these principles describe the specific strategies used or recommended to achieve the broad objectives defined by the study parameters. Within each category, principles are listed in the decreasing order of importance suggested by the researcher (Table 7).

Table 7. Kirkindall Principles Ordered by Category.

Category	Principle
Planning	The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.
	Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.
	The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts. *
	Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.
	Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretative opportunities.
	Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.
	Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail. *
Design	A nature trail should do more than provide *opportunity* for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.
	Trail and structures (especially rest stations) should be designed for maximum multi-sensory opportunities.
	Multi-sensory consideration should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season specific weather, wildlife, and habitat characteristics.
	To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.
	Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 and 6').
	A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.

Table 7. Kirkindall Principles Ordered by Category.

Category	Principle
	Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to back track.
	The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.
	Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design principles.
	Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.
	All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.
Safety	Trail use should be restricted to wheelchair and foot traffic only.
	Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.
	There should be a telephone at the trailhead for emergency use.
	Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.
Parking	Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.
	Additional accessible parking can be provided by using a barrier-free, hard packed surface for general parking.
	Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.
	To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.

Table 7.	**Kirkindall Principles Ordered by Category.**
Category	Principle
Signs & Brochures	Promotional materials should include specific information about trail facts and amenities.
	Thorough and clear information on trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.
	Trails should be designated by the Universal Symbol of Accessibility in conjunction with an explanation such as "This trail is accessible to all" or "A Universal Design Trail".
	Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).
Topography	If site characteristics permit, the trail route should include topographic variation (elevation changes).
	Design alternatives such as strategically spaced short plateaus can be used to mitigate steep slopes.
	The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations at or near mid-points and high points of the steepest slopes.
Surface	Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal. *
	Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or the use of rolling dip water bars.
	Outsloping of trail surface should be just enough to permit water run-off with minimum cross-slope.
	Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional and grade changes, as well as trail intersections.

Table 7. Kirkindall Principles Ordered by Category.	
Category	Principle
Structures	All spaces and structures should be designed to be practical and user friendly.
	Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.
	Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.
	Trail route and structures should be designed for visual vantage point heights in the 3-6 ft range.
	The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).
	Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.
	Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.

*duplicated by Delphi Panel

Seven of these 44 principles fall into the "Planning" category. Eleven appear in "Design", four in "Safety", four in "Parking" four in "Signs and Brochures", and three in "Topography" There are four under "Surface", and seven in the "Structures" category. Three principles (two "Planning" and one "Surface") are similar enough to principles developed by the Delphi panel that they were not duplicated on the questionnaire forms.

Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles

Responses to the Kirkindall design principles were not normally distributed (see Table A-6). More than 90% of all responses to each of the 44 principles fell under "somewhat important", "very important", and "one of the most important." In fact, most principles received between 50% - 80% of responses in the "very important" and "one of the most important" columns. Clearly, participants deemed two principles most important by virtue of 91% - 95% of all responses falling into the two highest rating categories. These principles dealt with protecting site integrity (minimizing impact to site physical features and aesthetic qualities) and trail surface material characteristics and appearance.

Several subtle but noteworthy nuances can be seen related to trail surface principles. While most participants agreed that trail surface issues (traction, maintenance, durability, and appearance) were among the most important, much less importance was given to principles dealing with trail surface accommodations for different types of disabilities. Twenty-four percent of those responding to the principle addressing trail surface texture accommodations for sight-impaired visitors rated this principle as "not at all important" or "not very important." More than 40% saw this principle as only "somewhat important." Over 10% of people responding to the principle describing methods of erosion control without using elevated water bars (which, at the very least, diminish accessibility) rated it as "not at all important" or "not very important."

These results indicate that specific kinds of accessibility implementation measures related to surface issues were not recognized as being as important as surface characteristics and appearance. Since the association between these factors and accessibility was more implied than stated explicitly, it is possible that subjects may not have made the connection between these specific surface accommodations and their relationship to accessibility issues.

One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status

Analysis of variance between the two groups in all eight categories of Kirkindall principles (Table A-7) revealed that of the 44 Kirkindall principles, seven were found to have significant differences in importance ratings between the disability- and no-disability-concerns groups (Table 8). Only one principle, dealing with rest station location, had a higher mean among the group with no disability concerns (Figure 5).

Table 8. One-way ANOVA Results of Kirkindall Principles with Significant Differences ($p < 0.05$) by Visitor Disability Concerns Status. n = 79

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.				
Disability Concerns	38	4.26	.64	
No Disability Concerns	41	3.93	.72	.032
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.				
Disability Concerns	38	3.71	.80	
No Disability Concerns	39	4.13	.83	.028

Table 8. One-way ANOVA Results of Kirkindall Principles with Significant Differences ($p < 0.05$) by Visitor Disability Concerns Status. n = 79

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Trail use should be restricted to wheelchair and foot traffic only.				
Disability Concerns	35	4.43	.70	
No Disability Concerns	41	3.90	.94	.008
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.				
Disability Concerns	38	4.08	.91	
No Disability Concerns	41	3.63	.99	.042
Promotional materials should include specific information about trail facts and amenities.				
Disability Concerns	36	4.56	.50	
No Disability Concerns	41	3.98	.85	.001
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.				
Disability Concerns	38	4.13	.74	
No Disability Concerns	39	3.62	.96	.010
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.				
Disability Concerns	38	4.68	.53	
No Disability Concerns	41	4.29	.72	.007

$\alpha < 0.05$

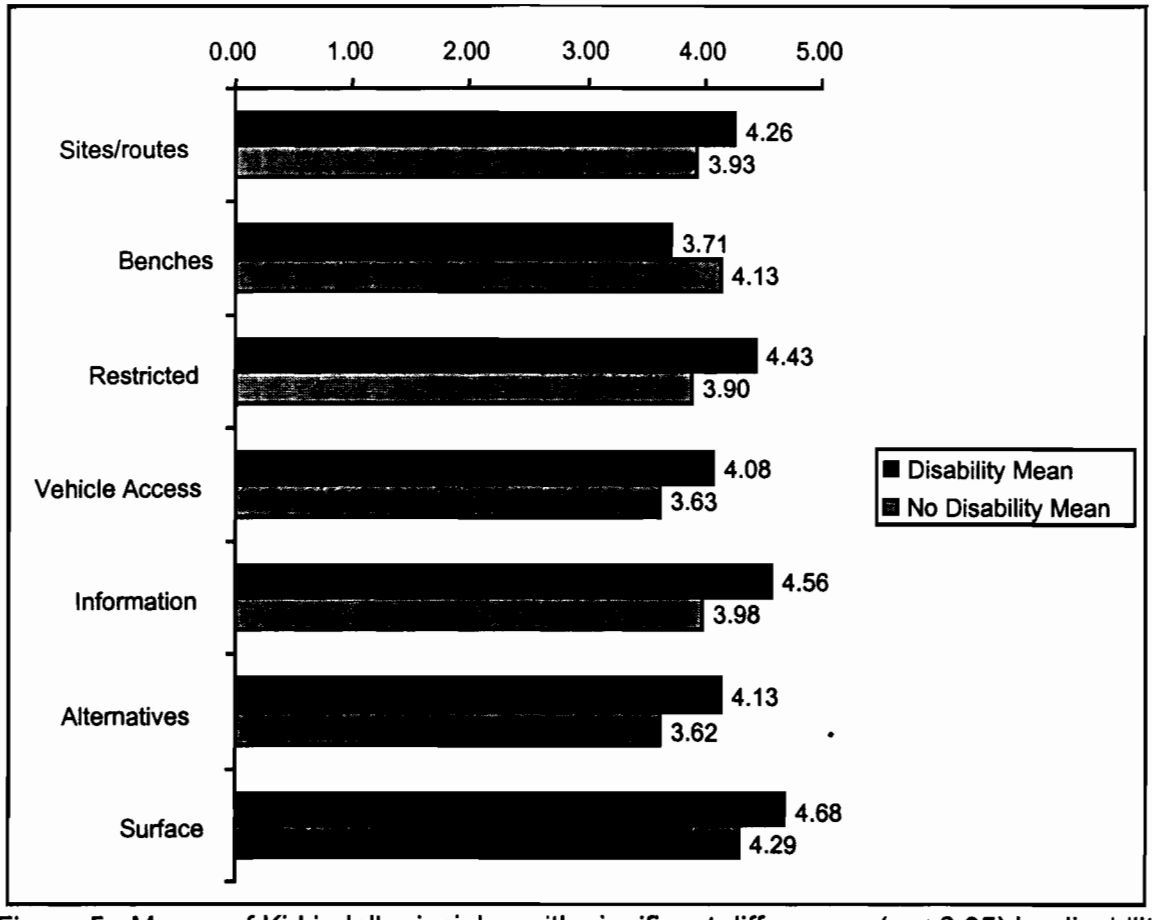

Figure 5. Means of Kirkindall principles with significant differences ($p < 0.05$) by disability concerns status.

The two "Safety" principles seen as more important by the disability-concerns group pertained to emergency vehicle access and restricted trail use. Four of the other five categories each had one principle ranked with a significant difference between groups. These included site selection from "Planning," promotional materials from "Signs & Brochures," grade mitigation from "Topography," and surface material from "Surface." Only the "Design" principle dealing with rest station location was rated as more highly important by the no-disability-concerns group.

Among the seven principles with significant differences, the disability-concerns group rated as more important certain principles relevant to equalizing trail experience opportunities for all visitors such as criteria of site selection, grade mitigation, and the importance of informative promotional materials. This group also attached greater importance to principles addressing safety concerns. The no-disability-concerns group placed a higher value on the importance of providing opportunities for solitude and quiet reflection.

These results indicate that while there were relatively few statistically significant differences between the two groups, the disability-concerns group, with greater homogeneity, generally tended to consider most of the principles associated with accessibility to be somewhat more important than did the other group. Indeed, 29 principles had higher means among the participants with disability concerns; 15 were scored higher in the group with no disability concerns. With the exception of "Safety," where two of four principles were perceived as significantly more important by the group with disability concerns, there was no single category where the two groups had major differences in their perceptions of principle importance. In fact, two categories, "Parking" and "Structures" had no statistically significant differences between the two groups. That there were no significant differences between groups on "Parking" and "Structures" issues may reflect an awareness born of familiarity. Structural and parking accommodations were the first areas to be addressed (in retro-fitting as well as new design) in attempts to enhance accessibility in essentially every setting.

Kirkindall Principles Rank-Ordered by Mean Scores of Trail Visitors

Several interesting thematic groupings as well as apparent inconsistencies or contradictions occur in the ranking order (Table A-8). Six of the top seven most important principles are all dedicated to issues of site integrity and the benefits afforded by opportunities for multi-sensory experience (Table 9). In fact, the most important issue for visitors was the concern that care should be taken in all phases of a project to protect site integrity. However, along with concerns about minimizing impact and protecting a site's physical features and aesthetic qualities, participants ranked very highly (third overall) the importance of spaces and structures being designed for practicality and user-friendliness.

The second most important principle dealt with surface material characteristics and appearance, but trail surface issues specifically relevant to accessibility such as cross-slope, the use of at-grade drainage (no elevated water barriers), and textured surface cues for visually impaired visitors, were ranked 40th, 43rd, and 44th, respectively. Participants deemed it relatively important to be provided specific information about trail facts. Principles addressing this with respect to both promotional materials as well as trail brochures and signage were ranked eighth and 11th respectively. Principles dealing with design and site/route criteria appeared within the top half of ranking (12th and 18th overall), reflecting the importance of having universally accessible trails which are as consistent in quality of experience opportunities as any other trail.

Participants acknowledged the importance of grade issues for wheelchair users (ninth overall), yet two other principles addressing methods of mitigating the degree of difficulty of grades through rest station placement and the use of strategically placed plateaus were ranked 16th and 35th respectively. The importance of having accessible parking that is both amply proportioned and functionally versatile was ranked 15th, but the principle suggesting the provision of additional accessible parking through use of a barrier-free, hard-packed general parking surface was ranked no higher than 37th.

Many principles that were rated less important were oriented toward specific application measures designed to accomplish accessibility objectives as opposed to the broad, general concepts of universal design. Inconsistencies or contradictions may indicate that participants recognized the importance of the general concepts associated with trail accessibility but failed to appreciate the connections between the concepts and the applicable methodology needed to address those concepts. It might also be construed that participants expressed a recognition of the importance of having accessible trails without really being concerned about the specific details of how design and construction occurs.

Table 9. Top 12 Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

	Descriptive Statistics			
Principle	Rank	Mean	Std. Dev.	n
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site. (Site integrity)	1	4.68	.57	79
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal. (Site integrity)	2	4.48	.66	79

Table 9. Top 12 Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
All spaces and structures should be designed to be practical and user-friendly.	3	4.39	.70	75
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users. (Multi-sensory)	4	4.31	.87	78
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge. (Site integrity)	5	4.29	.72	77
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities. (Multi-sensory)	6	4.29	.76	78
Promotional materials should include specific information about trail facts and amenities.	7	4.25	.76	77
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities. (Multi-sensory)	8	4.25	.77	75
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	9	4.23	.72	79
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	10	4.22	.89	79
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	11	4.21	.83	77
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	12	4.18	.78	76

maximum possible mean = 5.0

Gamma Statistics for Kirkindall Principles

Gamma values for the Kirkindall principles ranged from 0.149 to 0.723 (Table A-9). Due to the broader range and number of principles being considered, a higher standard for relatedness was used for the Kirkindall principles than was used for those developed by the Delphi panel. Using 0.6 as the minimum acceptable gamma, 32 of 44 principles were eliminated reducing the number to the most strongly associated 12 (Table 10).

Table 10. Gamma Statistics for the 12 Most Highly Associated Kirkindall Principles. n = 50

Principle	Gamma Statistic
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	.723
Thorough and clear information on trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	.720
The potential for social interaction opportunities can be maximized at rest stations by providing wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	.712
Trail and structures (especially rest stations) should be designed for maximum multi-sensory opportunities.	.682
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	.670
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	.669
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	.658

Table 10. Gamma Statistics for the 12 Most Highly Associated Kirkindall Principles. n = 50

Principle	Gamma Statistic
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	.644
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	.632
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	.619
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	.614
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	.601

minimum acceptable gamma = 0.60

Among these 12 principles, two dominant thematic categories emerged. Nine of these 12 addressed "Design" issues and the other three dealt with "Signs and Brochures." Regardless of the area of design or signage concern, the common focus of each of the 12 principles is the importance of providing trails that allow universal access and multi-sensory experience while maintaining the integrity of the site.

Combined Delphi/Kirkindall Principles Gamma and Mean Values

Gamma values for the 25 combined Delphi/Kirkindall principles ranged from 0.506 to 0.723, and means of visitor importance ratings ranged between 3.70 and 4.48 (Table 11). Items were grouped together into two main thematic categories. Though not necessarily ranked most important, issues addressing design concerns and the provision and exchange of information represented the most strongly associated of the 59 principles on the questionnaire.

Table 11. Gamma and Mean Values for the 25 Most Highly Associated Combined Delphi/Kirkindall Principles.

Principle	Descriptive Statistics	
	Gamma	Mean
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	.723	3.95
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	.722	4.42
Thorough and clear information re trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	.720	4.21
The potential for social interaction opportunities can be maximized at rest stations by providing wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	.712	3.90
Trail and structures (especially rest stations) should be designed for maximum multi-sensory opportunities.	.682	4.25
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	.680	4.23
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	.670	3.93
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	.669	4.25
Planners, designers, and resource managers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	.666	3.94
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	.658	3.94
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	.657	4.18
Planning and design needs to evolve with input from all user populations.	.655	4.15

Table 11. Gamma and Mean Values for the 25 Most Highly Associated Combined Delphi/Kirkindall Principles.

Principle	Descriptive Statistics	
	Gamma	Mean
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	.655	4.03
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	.644	3.92
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	.632	3.84
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	.619	4.29
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	.614	3.70
Interpretive planning should incorporate tactile and auditory options.	.612	3.78
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	.601	4.14
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	.597	4.48
Benches and rest stations are a critical element of trail design.	.559	4.21
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	.556	4.01
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	.523	4.39
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	.506	4.29
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	.506	3.94

minimum acceptable gammas = 0.60 (Kirkindall) and 0.50 (Delphi)
plain text - Kirkindall; *italics - Delphi;* **bold - both**

Combined Delphi/Kirkindall Principles Rank-Ordered By Mean Scores of Trail Visitors

Of 59 combined principles produced by Kirkindall and the Delphi panel (Table A-10) with means ranging from 3.12 to 4.68, 25 were judged most important by participants (Table 12). Of the 25 principles ranked most important by participants, 16 are Kirkindall principles, seven are Delphi panel principles, and two are principles common to both. These 25 most important principles, though selected from various questionnaire categories, can all be grouped under the two main headings of site integrity and universal access.

Table 12. Top 25 Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

	Descriptive Statistics			
Principle	Rank	Mean	Std. Dev.	n
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	1	4.68	.57	79
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	2	4.48	.66	79
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	3	4.42	.73	79
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	4	4.41	.67	79
All spaces and structures should be designed to be practical and user-friendly.	5	4.39	.70	75

Table 12. Top 25 Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	6	4.39	.74	79
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.	7	4.31	.87	78
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.	8	4.29	.76	78
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	9	4.29	.79	78
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	10	4.29	.72	77
Promotional materials should include specific information about trail facts and amenities.	11	4.25	.76	77
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	12	4.25	.77	75
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	13	4.23	.72	79
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	14	4.23	.75	79
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	15	4.22	.89	79

Table 12. Top 25 Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 79

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	16	4.21	.83	77
Benches and rest stations are a critical element of trail design.	17	4.21	.85	76
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	18	4.18	.78	76
Planning and design needs to evolve with input from all user populations.	19	4.15	.85	78
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	20	4.14	.73	79
Trail use should be restricted to wheelchair and foot traffic only.	21	4.14	.87	76
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on <u>both</u> sides.	22	4.13	.81	76
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.	23	4.10	.79	77
There should be a telephone at the trailhead for emergency use.	24	4.10	.99	78
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.	25	4.09	.70	79

maximum possible mean = 5.0
plain text - Kirkindall; *italics - Delphi;* **bold - both**

The most highly ranked principles were those pertaining to site integrity and aesthetic appeal. Second in importance but with the highest frequency of responses (17 of the top 25) were issues pertaining directly to the concept of universal accessibility. Many of the principles ranked toward the bottom of the scale were those addressing specific design and construction strategies. This indicates a recognition of the importance of providing trails and amenities that permit and encourage use by all people regardless of level of ability or type of disability. However, participants also indicated that they are not as concerned about how this is achieved as long as the process doesn't sacrifice site integrity.

Visitor Agreement Ratings of SFA Trail Objectives

The frequency and distribution of the responses of the 108 visitors who participated in the evaluation of the SFA Trail were not normally distributed (Table A-11). Only two statements received "strongly disagree" responses. "The setting was an excellent choice for a nature trail" and "The trail surface had a natural appearance and blended well with the environment" each received one "strongly disagree." However, these same two statements also received, respectively, over 83% and more than 61% of total responses in the "strongly agree" column.

Generally speaking, all other trail objective statements had between 80% and 100% of responses in the "agree somewhat" and "strongly agree" columns. Approximately 60% of visitors strongly agreed with all but two statements. These two exceptions dealt with the degree of accessibility of the non-paved surface of the parking area and the potential for group interaction at rest stations, which were rated next to last and last in importance (see Table A-15). In fact,

the overall highest percentage of strong agreement (more than 86%) indicated that visitors thought the parking area was adequate and appropriate and that other rest station design objectives (besides group interaction opportunities) had been satisfactorily accomplished.

Perhaps most significant was that 93.5% agreed that the trail helped them to experience a sense of connection with nature, more than 97% agreed it provided opportunities for quality outdoor experience with loved ones, and over 98% of all participants agreed that anyone (with or without disabilities) could enjoy the SFA Trail. Responses to these three statements are perhaps more important than any other part of the trail evaluation, because visitors not only agreed that design and construction objectives had been accomplished, but virtually everyone who visited the SFA Trail agreed that it could be enjoyed by anyone.

One-way ANOVA Results of SFA Trail Agreement Statements by Disability Concerns Status

Visitors with disability concerns generally more strongly agreed with the trail objective statements than did the other group (Table A-12). In fact, mean values of 25 of 36 statements (more than two thirds) show stronger agreement among the group with disability concerns. The two groups shared the same mean value on two statements. There were significant differences ($p < 0.05$) between the two groups on ten statements (Table 13).

Table 13. One-way ANOVA Results of SFA Trail Agreement Statements with Significant Differences (p < 0.50) by Disability Concerns Status. n = 108

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The information provided did not diminish the element of adventure or discovery of the trail experience.				
Disability Concerns	47	4.70	.62	
No Disability Concerns	59	4.41	.72	.028
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.				
Disability Concerns	48	4.85	.36	
No Disability Concerns	59	4.56	.70	.009
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.				
Disability Concerns	48	4.87	.33	
No Disability Concerns	60	4.67	.48	.012
The setting was an excellent choice for a nature trail.				
Disability Concerns	47	4.94	.25	
No Disability Concerns	59	4.69	.70	.027
The trail surface had a natural appearance and blended well with the environment.				
Disability Concerns	47	4.72	.62	
No Disability Concerns	60	4.17	1.04	.002
The route of the trail provided a satisfying variety of scenery and topography.				
Disability Concerns	48	4.85	.36	
No Disability Concerns	60	4.57	.62	.005
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.				
Disability Concerns	48	4.33	.78	
No Disability Concerns	60	4.65	.61	.019

Table 13. One-way ANOVA Results of SFA Trail Agreement Statements with Significant Differences (p < 0.50) by Disability Concerns Status. n = 108

Statement	Descriptive Statistics			
	n	Mean	Std. Dev.	p
The trail provides opportunities for quality outdoor experience with loved ones.				
Disability Concerns	48	4.90	.37	
No Disability Concerns	60	4.65	.55	.009
The trail helped me experience a sense of connection with nature.				
Disability Concerns	48	4.73	.49	
No Disability Concerns	60	4.38	.67	.003
I think anyone (with or without disabilities) could enjoy this trail.				
Disability Concerns	48	4.92	.28	
No Disability Concerns	60	4.68	.54	.007

$\alpha < 0.05$

In every case but one, there was stronger and more homogeneous agreement among the disability-concerns group (Figure 6).

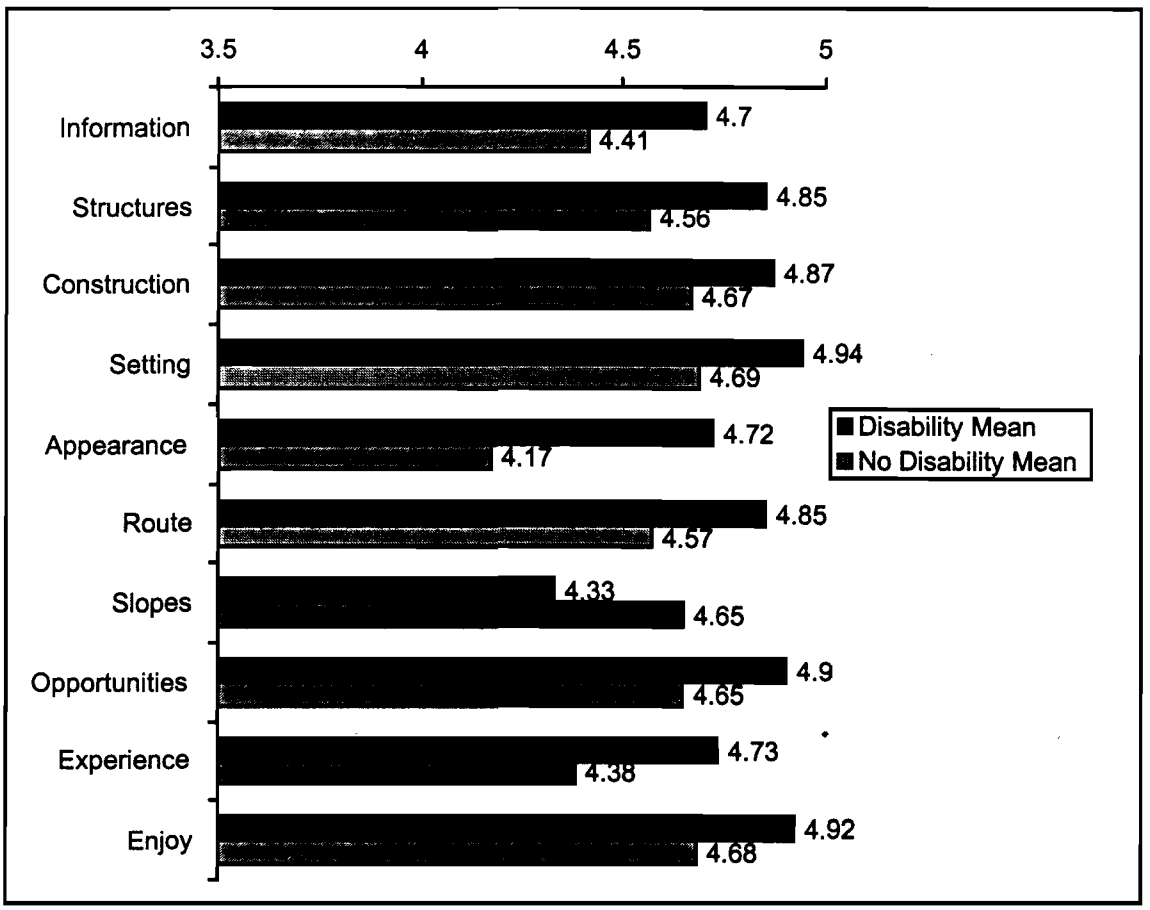

Figure 6. Means of SFA Trail agreement statements with significant differences ($p < 0.05$) by disability concerns status.

Those with disability concerns agreed more strongly that: 1) brochure information did not diminish the element of discovery; 2) structures were well integrated into the landscape; 3) construction did not appear to negatively impact the site; 4) the setting was an excellent choice for a nature trail; 5) the trail surface blended with the environment; 6) the trail route provided satisfying variety; 7) the trail provided quality outdoor experience; 8) provided connection with nature; and 9) could be enjoyed by anyone. The group with no disability concerns agreed more strongly that slopes along the trail enhanced the enjoyment of the outdoor experience.

The disability-concerns group, with fewer kinds of trail experiences to compare, may have been more attentive to the site than to the accommodations that made it accessible. The other group, perhaps more experienced with non-accessible nature trails, tended to be more aware of the measures taken to provide access. With the lowest mean (4.17) and the highest standard deviation (1.04), this group was especially less enthusiastic about the trail surface. The no-disability-concerns group appeared to be generally somewhat more critical of the accessible accommodations of trail and structure design, yet, for the most part, no less satisfied with their experience.

Visitor Importance Ratings of SFA Trail Statements

The frequency and distribution or responses to the Importance statements were not normally distributed (Table A-13). The distribution clearly demonstrates that visitors found issues related to parking, signs and brochures, and rest stations much less important than design issues associated with aesthetics, site integrity, universal access, and the recreation experience. Statements about parking, signage, and structures consistently received from 20% to 40+% of their responses no higher than "somewhat important." With only three exceptions, aesthetics, site integrity, and access issues received between 80% and 95% of all responses in the "very important" and "one of the most important" columns. The three exceptions, all addressing slope and cross-slope issues, still had as many as 75% to 79% of responses in the top two importance categories. With more than 96% of participants marking it in the highest level of importance, perhaps the single most significant statement about the SFA Trail is that it could be enjoyed by anyone (with or without disabilities).

One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status

Of the 36 statements evaluated by participants, only two had any significant difference in responses between the two groups (Table 14).

Table 14. One-way ANOVA Results of SFA Trail Importance Statements with Significant Differences ($p < 0.05$) by Disability Concerns Status. n = 108

	Descriptive Statistics			
Statement	n	Mean	Std. Dev.	p
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.				
Disability Concerns	46	4.35	.82	
No Disability Concerns	59	4.02	.78	.037
The trail surface was barrier-free, firm, stable, and provided good traction.				
Disability Concerns	48	4.67	.48	
No Disability Concerns	59	4.37	.87	.038

$\alpha < 0.05$

Figure 7 shows the comparison of the two groups on the two statements.

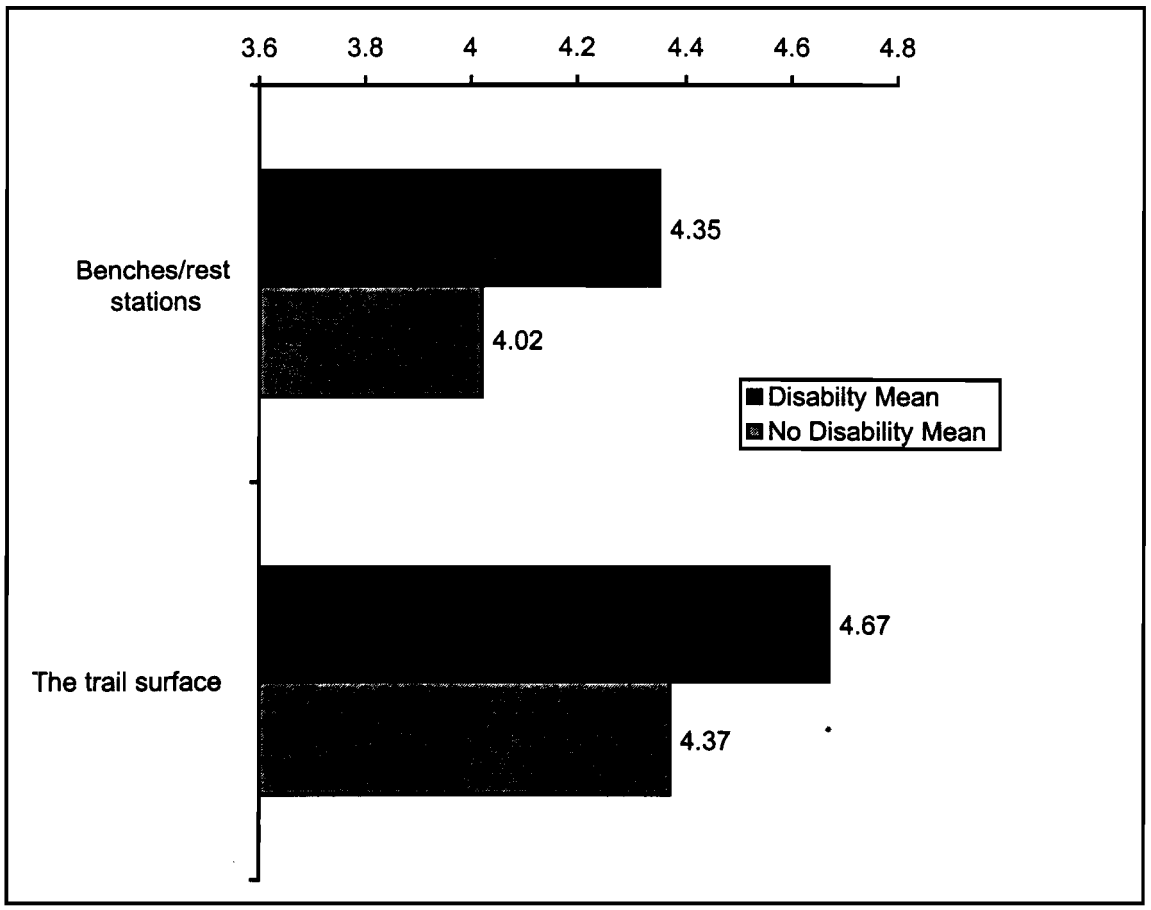

Figure 7. Means of SFA Trail importance statements with significant differences ($p < 0.05$) by disability concerns status.

"The trail surface was barrier-free, firm, stable, and provided good traction" had a significance level of .038 with means of 4.67 and 4.37. Visitors with disability concerns ranked this statement more important than did those with no disability concerns. Heightened awareness of the stated trail surface characteristics resulting from experience with barriers to access in other situations may have contributed to the importance attached to this issue by the disability-concerns group. The disability-concerns group also had a higher mean as well as a higher standard deviation on the statement about bench location and orientation indicating that even though this was considered to be an

important issue, there was considerable variability among this group on just how important. This may be at least partially explained by the possibility that bench/rest stations may have been given little attention by wheelchair users.

The disability-concerns group also rated all but five of the remaining 30 statements more important (though the differences were not statistically significant) (see Table A-14). Only three statements had slightly higher mean values among the no-disability-concerns group. Two statements produced the same mean value from both groups. For the most part, the two groups rated the qualities of the SFA Trail to be relatively important to their trail experience regardless of disability status (see Table A-15).

SFA Trail Importance Statements Rank-Ordered by Mean Scores of Visitors

With mean values of the 36 importance statements ranging from 3.50 to 4.73 (Table A-15), the top 20 judged most important by participants (Table 15) indicated that the most important objectives of the trail designer were consistent with the priorities of trail visitors.

Table 15. Top 20 SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 108

		Descriptive Statistics		
Principle	Rank	Mean	Std. Dev.	n
I think anyone (with or without disabilities) could enjoy this trail.	1	4.73	.52	107
The setting was an excellent choice for a nature trail.	2	4.71	.49	105
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.	3	4.61	.59	107

Table 15. Top 20 SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 108

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
The route of the trail provided a satisfying variety of scenery and topography.	4	4.52	.60	107
The trail helped me experience a sense of connection with nature.	5	4.52	.66	107
The trail surface was barrier-free, firm, stable, and provided good traction.	6	4.50	.73	107
The trail provides opportunities for quality outdoor experience with loved ones.	7	4.48	.63	107
The trail seemed to showcase the beauty and most positive aspects of the site.	8	4.46	.59	106
The trail was well integrated into the landscape.	9	4.46	.59	107
The amount and types of modification made for the trail seem adequate and appropriate to the setting.	10	4.42	.58	105
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.	11	4.42	.73	107
The trail surface had a natural appearance and blended well with the environment.	12	4.29	.74	106
The trail facilitated enjoyment of the special elements and features of the site.	13	4.27	.67	107
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.	14	4.27	.72	106
The route of the trail followed the natural contours of the landscape.	15	4.25	.69	107
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.	16	4.17	.79	107

Table 15. Top 20 SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors. n = 108

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.	17	4.16	.81	105
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.	18	4.12	.90	104
The cross-slope was never so steep as to cause difficulty or discomfort.	19	4.11	.93	107
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).	20	4.09	.91	107

maximum possible mean = 5.0

Most important was that the trail could be enjoyed by anyone (with or without disabilities). Seven of the next 15 most important descriptive statements about the trail focus on blending the trail into the landscape. Five address the importance of facilitating for all users, enjoyment of the elements of the site by the trail design, and two center on the aesthetic qualities of the site. Visitors ranked opportunities for group interaction at rest stations as the least important stated objective of the trail. Visitors clearly indicated that the most important features of the SFA Trail are its universal appeal, its universal access, and its integration into the site in such a way as to facilitate enjoyment rather than detract from it.

CONCLUSIONS

The purpose of this study was threefold: to develop a practical set of principles designed to convert ADA criteria into site- and user-friendly applicable trail design methodology; to design and construct a universally accessible nature trail based on those principles; and to evaluate those principles and that trail by surveying trail users. Some limitations were imposed due to a variety of factors including a small sample, an inordinate number of missing values, and lengthy and technically oriented questionnaires. Due to these limitations, attempts to use correlation coefficients, factor analysis, and principal component analysis with the data were unsuccessful.

The gamma statistic was used in lieu of these procedures because, as a non-Chi Square-based measure, it does not require normal distribution and is not impacted by the number of cases. The gamma was somewhat useful in empirically grouping associated items, but might have been more effective as an intermediate step in reducing the number of questionnaire items and/or part of the process of predicting how the different groups would respond to questionnaire items.

Despite certain limitations and constraints imposed by study and data conditions, the various instruments and procedures produced some meaningful results. There tended to be agreement, for the most part, on the order in which principles should be ranked. Though there were relatively few statistically significant differences between the two groups, generally speaking, people with

disability concerns considered the majority of issues to be slightly more important than did people with no disability concerns. People with disability concerns also more strongly agreed with the SFA Trail objective statements. Regardless of disability concerns status, the principles ranked most important by participants addressed concerns about protecting site integrity, communication/collaboration between all parties involved in trail projects, and universal access issues (including: site/route selection, equal experience opportunities, and user-friendly design of spaces and structures).

The combination of these concerns is reflected in the unified focus of all aspects of the study which address trail surface characteristics and appearance. Trail surface appears to be the fulcrum upon which all other issues of importance balance. The importance of having a low maintenance, stable surface that provides adequate traction, is barrier-free and natural appearing is critical to meeting needs and expectations for management and maintenance concerns as well as visitor concerns about accessibility, site integrity, and aesthetic appeal.

It should be noted that while the concept of universal accessibility was rated as highly important, several apparent inconsistencies can be pointed out. These inconsistencies are most apparent specifically with respect to other trail surface issues. Principles dealing with flush drainage (eliminating the use of elevated water bars), mitigation of slopes through rest station placement and the use of strategically placed plateaus, minimization of cross-slope, surface texture cues for vision-impaired visitors, and experimentation with alternate surface materials were all ranked very low in importance.

It could be interpreted that participants failed to understand the meanings of design terminology, implications for design applications, or to recognize the

relationship between these issues and accessibility. With respect to trail surface materials, it might also be construed that study participants, while feeling this to be a critical element for meeting their expectations, attached little importance to the need for experimentation with alternate materials because they were highly satisfied with the qualities of soil-cement as a trail surface material. A broader inference might be that while participants embraced the general concept of universal access and positively ranked the design effectiveness of the SFA Trail, there was relatively little concern among this study group about the specific methods of achieving accessibility on trails.

All principles developed by Kirkindall and the Delphi panel evolved from common parameters and objectives; that is, to define standards for nature trails that allow universal access, minimizing barriers (both physical and social) while preserving and protecting the integrity of the resource. Though there were some differences with respect to which principles were considered important, how important they were thought to be, and how participants ultimately evaluated them, there was one indisputable outcome. Participants overwhelmingly agreed that the objectives defined by the statements on the SFA Trail Evaluation had been met and that the most important of these were universal access, equal experience opportunity, and minimal impact to the physical features and aesthetic qualities of the site. As a completed example of the combined theoretical product of the Delphi Method and the result of concept-to-completion experience, tested and approved by trail users, the SFA Trail represents a successful combination of state of the art theory and practice in universally accessible nature trail design.

Isolated efforts have been made since passage of ADA to address the need for accessible trails. However, providing this type of recreation opportunity has remained a significant and perplexing responsibility for recreation managers. Without a standard set of guiding principles to reference, and successful examples of their application, recreation managers have been essentially on their own with respect to design and construction of accessible trails. This study took the initiative to combine trial-and-error learning experiences of pioneers in the field with state of the art expert opinion and input from trail users. The results produced a highly rated prototype trail and invaluable knowledge for future efforts to facilitate not only the proliferation of accessible trails, but quality and efficiency in their design and construction.

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APPENDIX A

Tables

Table A-1. Delphi Panel Principles Eliminated by One Vote Rank-Ordered by Descending Mean Scores of Panelists.

Principle	Descriptive Statistics			
	Rank (of 37)	Mean	Std. Dev.	n
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	5	4.58	1.16	12
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge	8	4.41	1.16	12
Incorporating opportunities for multi-sensory experience enhances the enjoyment and learning potential for all users.	14	4.25	1.22	12
There is a need for a database of examples of successful trails that comply with accessibility guidelines while appearing unobtrusive to the natural environment.	21	3.83	1.03	12
With proper education, training, and supervision, trail groups can be a useful resource for construction and maintenance operations.	22	3.83	1.11	12
When trail width is not sufficient to allow passing, pull-outs or widenings should be provided at strategic locations along the trail.	23	3.81	1.17	11
Where topography varies, trail pathways should be selected to include grades that *naturally* fit within the range defined by trail objectives.	25	3.75	1.22	12
Sites for accessible trails should be selected according to their access potential, as well as (not instead of) the criteria used for selection of other trail sites for the general public.	26	3.75	1.29	12
Resource managers should be specific about trail facts and amenities in promotional materials.	29	3.67	1.23	12
Design alternatives like strategically spaced short plateaus can be used to mitigate steep slopes.	30	3.58	1.24	12

Table A-1. Delphi Panel Principles Eliminated by One Vote Rank-Ordered by Descending Mean Scores of Panelists.

Principle	Descriptive Statistics			
	Rank (of 37)	Mean	Std. Dev.	n
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	31	3.58	1.38	12
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.	37	3.25	1.36	12

maximum possible mean = 5

Table A-2. Frequency Distribution of Visitor Importance Ratings of Delphi Panel's Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	1 1.3%	1 1.3%	21 26.6%	35 44.3%	21 26.6%	79 100%
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	0 0%	2 2.5%	11 13.9%	34 43%	29 36.7%	76 96.2%
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	0 0%	2 2.5%	10 12.7%	29 36.7%	37 46.8%	78 98.7%
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	0 0%	1 1.3%	5 6.3%	34 43%	39 49.4	79 100%
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	0 0%	3 3.8%	2 2.5%	33 41.8%	41 51.9%	79 100%
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	0 0%	1 1.3%	9 11.4%	27 34.2%	42 53.2%	79 100%
Planning and design needs to evolve with input from all user populations.	0 0%	2 2.5%	17 21.5%	26 32.9%	33 41.8%	78 98.7%

Table A-2. Frequency Distribution of Visitor Importance Ratings of Delphi Panel's Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	0 0%	6 7.6%	16 20.3%	34 43%	23 29.1%	79 100%
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	0 0%	3 3.8%	13 16.5%	40 50.6%	21 26.6%	77 97.4%
Interpretive planning should incorporate tactile and auditory options.	0 0%	3 3.8%	28 35.4%	28 35.4%	17 21.5%	76 96.2%
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site.	1 1.3%	8 10.1%	13 16.5%	33 41.8%	23 29.1%	78 98.7%
There should be no minimum or maximum lengths for accessible trails.	0 0%	7 8.9%	22 27.8%	33 41.8%	17 21.5%	79 100%
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	0 0%	3 3.8%	18 22.8%	30 38%	25 31.6%	76 96.2%
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.	0 0%	4 5.1%	21 26.6%	28 35.4%	24 30.4	77 97.4%
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	0 0%	1 1.3%	12 15.2%	34 43%	32 40.5%	79 100%

Table A-2. Frequency Distribution of Visitor Importance Ratings of Delphi Panel's Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	0 0%	0 0%	7 8.9%	27 34.2%	45 57%	79 100%
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.	0 0%	2 2.5%	28 35.4%	34 43%	14 17.7%	78 98.7%
Benches and rest stations are a critical element of trail design.	0 0%	3 3.8%	12 15.2%	27 34.2%	34 43%	76 96.2%

Table A-3. One-way ANOVA Results of Delphi Panel Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Providing full spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.				
Disability Concerns	38	3.95	.87	
No Disability Concerns	41	3.93	.82	.914 n.s.
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.				
Disability Concerns	36	4.36	.64	
No Disability Concerns	40	4.03	.86	.060 n.s.
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.				
Disability Concerns	37	4.46	.77	
No Disability Concerns	41	4.15	.79	.081 n.s.
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.				
Disability Concerns	38	4.47	.65	
No Disability Concerns	41	4.34	.69	.384 n.s.
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.				
Disability Concerns	38	4.53	.65	
No Disability Concerns	41	4.32	.79	.203 n.s.
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.				
Disability Concerns	38	4.58	.60	
No Disability Concerns	41	4.22	.82	.030*
Planning and design needs to evolve with input from all user populations.				
Disability Concerns	37	4.27	.80	
No Disability Concerns	41	4.05	.89	.255 n.s.

Table A-3. One-way ANOVA Results of Delphi Panel Principles by Visitor Disability Concerns Status.

Principle	n	Descriptive Statistics Mean	Std. Dev.	p
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.				
Disability Concerns	38	4.26	.72	
No Disability Concerns	41	3.63	.94	.001*
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.				
Disability Concerns	37	4.19	.70	
No Disability Concerns	40	3.88	.82	.076 n.s.
Interpretive planning should incorporate tactile and auditory options.				
Disability Concerns	37	3.97	.76	
No Disability Concerns	39	3.59	.88	.047*
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site.				
Disability Concerns	38	3.87	1.04	
No Disability Concerns	40	3.90	.96	.889 n.s.
There should be no minimum or maximum lengths for accessible trails.				
Disability Concerns	38	3.92	.82	
No Disability Concerns	41	3.61	.95	.123 n.s.
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.				
Disability Concerns	35	4.14	.77	
No Disability Concerns	41	3.90	.92	.225 n.s.
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.				
Disability Concerns	36	4.00	.89	
No Disability Concerns	41	3.88	.90	.554 n.s.

Table A-3. One-way ANOVA Results of Delphi Panel Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes.				
Disability Concerns	38	4.34	.67	
No Disability Concerns	41	4.12	.81	.194 n.s.
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.				
Disability Concerns	38	4.68	.53	
No Disability Concerns	41	4.29	.72	.007*
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.				
Disability Concerns	37	3.84	.69	
No Disability Concerns	41	3.71	.84	.459 n.s.
Benches and rest stations are a critical element of trail design.				
Disability Concerns	37	4.24	.89	
No Disability Concerns	39	4.18	.82	.747 n.s.

* $\alpha < 0.05$

Table A-4. Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	1	4.48	.66	79
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	2	4.42	.73	79
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	3	4.41	.67	79
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	4	4.39	.74	79
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	5	4.29	.79	78
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	6	4.23	.75	79
Benches and rest stations are a critical element of trail design.	7	4.21	.85	76
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	8	4.18	.78	76
Planning and design needs to evolve with input from all user populations.	9	4.15	.85	78
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	10	4.03	.78	77
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	11	4.01	.86	76

Table A-4. Delphi Panel Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	12	3.94	.84	79
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.	13	3.94	.89	77
Planners, designers, and resource managers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	14	3.94	.90	79
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site.	15	3.88	.99	78
Interpretive planning should incorporate tactile and auditory options.	16	3.78	.84	76
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.	17	3.77	.77	78
There should be no minimum or maximum lengths for accessible trails.	18	3.76	.89	79

Table A-5. Gamma Statistics for Delphi Panel Principles. n = 63

Principle	Gamma Statistic
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	.722
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	.680
Planners, designers, and resource mangers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	.666
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	.657
Planning and design needs to evolve with input from all user populations.	.655
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	.655
Interpretive planning should incorporate tactile and auditory options.	.612
Surface material should provide traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	.597
Benches and rest stations are a critical element of trail design.	.559
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	.556
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	.523

Table A-5. Gamma Statistics for Delphi Panel Principles. n = 63

Principle	Gamma Statistic
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	.506
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	.506
There should be no minimum or maximum lengths for accessible trails.	.440
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.	.412
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	.388
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site.	.367
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.	.240

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.	0 0%	6 7.6%	25 31.6%	31 39.2%	15 19%	77 97.4%
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	0 0%	2 2.5%	11 13.9%	34 43%	29 36.7%	76 96.2%
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	0 0%	0 0%	4 5.1%	17 21.5%	58 73.4%	79 100%
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.	0 0%	3 3.8%	21 26.6%	22 27.8%	31 39.2%	77 97.4%
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.	0 0%	1 1.3%	13 16.5%	43 54.4%	22 27.8%	79 100%
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.	0 0%	2 2.5%	8 10.1%	33 41.8%	35 44.3%	78 98.7%
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	0 0%	3 3.8%	13 16.5%	40 50.6%	21 26.6%	77 97.4%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	0 0%	4 5.1%	12 15.2%	26 32.9%	37 46.8%	79 100%
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	0 0%	0 0%	13 16.5%	35 44.3%	31 39.2%	79 100%
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.	1 1.3%	4 5.1%	32 40.5%	26 32.9%	14 17.7%	77 97.4%
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design concepts.	0 0%	2 2.5%	18 22.8%	34 43%	25 31.6%	79 100%
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.	2 2.5%	0 0%	9 11.4%	28 35.4%	39 49.4	78 98.7%
There should be a telephone at the trailhead for emergency use.	0 0%	6 7.6%	16 20.3%	20 25.3%	36 45.6%	78 98.7%
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.	0 0%	9 11.4%	17 21.5%	30 38%	23 29.1%	79 100%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	0 0%	1 1.3%	9 11.4%	34 43%	33 41.8%	77 97.4%
Trail use should be restricted to wheelchair and foot traffic only.	0 0%	3 3.8%	15 19%	26 32.9%	32 40.5%	76 96.2%
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.	1 1.3%	2 2.5%	15 19%	32 40.5%	27 34.2%	77 97.4%
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	0 0%	3 3.8%	21 26.6%	34 43%	15 19%	73 92.3%
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on <u>both</u> sides.	0 0%	3 3.8%	11 13.9%	35 44.3%	27 34.2%	76 96.2%
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.	0 0%	4 5.1%	18 22.8%	33 41.8%	21 26.6%	76 96.2%
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	0 0%	4 5.1%	19 24.1%	29 36.7%	23 29.1%	75 94.9%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	0 0%	2 2.5%	19 24.1%	38 48.1%	17 21.5%	76 96.2%
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	0 0%	3 3.8%	11 13.9%	30 38%	33 41.8%	77 97.4%
Promotional materials should include specific information about trail facts and amenities.	1 1.3%	1 1.3%	6 7.6%	39 49.4%	30 38%	77 97.4%
If site characteristics permit, the trail route should include topographic variation (elevation changes).	1 1.3%	2 2.5%	23 29.1%	37 46.8%	16 20.3%	79 100%
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.	0 0%	5 6.3%	21 26.6%	30 38%	21 26.6%	77 97.4%
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	0 0%	0 0%	7 8.9%	27 34.2%	45 57%	79 100%
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional changes, as well as intersections.	5 6.3%	14 17.7%	32 40.5%	21 26.6%	6 7.6%	78 98.7%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or use of rolling dip water bars.	1 1.3%	7 8.9%	24 30.4%	31 39.2%	8 10.1%	71 89.8%
Outsloping of trail should be just enough to permit water run-off with minimum cross-slope.	0 0%	2 2.5%	26 32.9%	39 49.4%	8 10.1%	75 94.9%
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).	0 0%	2 2.5%	16 20.3%	34 43%	25 31.6%	77 97.4%
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.	0 0%	3 3.8%	12 15.2%	42 53.2%	22 27.8%	79 100%
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	0 0%	1 1.3%	13 16.5%	39 49.4%	26 32.9%	79 100%
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	0 0%	4 5.1%	28 35.4%	31 39.2%	13 16.5%	76 96.2%
Trail and structures (especially rest stations) should be designed for maximum multi-sensory experience.	0 0%	3 3.8%	15 19%	32 40.5%	27 34.2%	77 97.4%
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	1 1.3%	2 2.5%	18 22.8%	34 43%	20 25.3%	75 94.9%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
All spaces and structures should be designed to be practical and user-friendly.	0 0%	0 0%	9 11.4%	28 35.4%	38 48.1%	75 94.9%
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.	0 0%	1 1.3%	20 25.3%	26 32.9%	28 35.4%	75 94.9%
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.	0 0%	3 3.8%	21 26.6%	32 40.5%	21 26.6%	77 97.4%
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.	0 0%	2 2.5%	21 26.6%	33 41.8%	21 26.6+%	77 97.4%
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	1 1.3%	0 0%	9 11.4%	34 43%	31 39.2%	75 94.9%
The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	2 2.5%	0 0%	22 27.8%%	33 41.8%	20 25.3%	77 97.4%
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	1 1.3%	3 3.8%	21 26.6%	27 34.2%	25 31.6%	77 97.4%

Table A-6. Frequency Distribution of Visitor Importance Ratings of the Kirkindall Design Principles.

Principle	Importance					n
	not at all	not very	somewhat	very	one of the most	
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.	0 0%	2 2.5%	14 17.7%	35 44.3%	26 32.9%	77 97.4%

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.				
Disability Concerns	36	3.72	.91	
No Disability Concerns	41	3.71	.84	.941 n.s.
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.				
Disability Concerns	36	4.36	.64	
No Disability Concerns	40	4.03	.86	.060 n.s.
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.				
Disability Concerns	38	4.58	.60	
No Disability Concerns	41	4.78	.52	.115 n.s.
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.				
Disability Concerns	36	4.22	.80	
No Disability Concerns	41	3.90	1.00	.127 n.s.
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.				
Disability Concerns	38	4.26	.64	
No Disability Concerns	41	3.93	.72	.032*
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.				
Disability Concerns	38	4.37	.67	
No Disability Concerns	40	4.23	.83	.407 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.				
Disability Concerns	37	4.19	.70	
No Disability Concerns	40	3.88	.82	.076 n.s.
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.				
Disability Concerns	38	4.29	.87	
No Disability Concerns	41	4.15	.91	.477 n.s.
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.				
Disability Concerns	38	4.29	.80	
No Disability Concerns	41	4.17	.63	.464 n.s.
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.				
Disability Concerns	37	3.68	.91	
No Disability Concerns	40	3.58	.87	.623 n.s.
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design concepts.				
Disability Concerns	38	4.21	.70	
No Disability Concerns	41	3.88	.87	.067 n.s.
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature.				
Disability Concerns	37	4.46	.80	
No Disability Concerns	41	4.17	.92	.146 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
There should be a telephone at the trailhead for emergency use.				
Disability Concerns	37	4.14	1.06	
No Disability Concerns	41	4.07	.93	.784 n.s.
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.				
Disability Concerns	38	4.08	.91	
No Disability Concerns	41	3.63	.99	.042*
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.				
Disability Concerns	36	4.44	.61	
No Disability Concerns	41	4.15	.79	.071 n.s.
Trail use should be restricted to wheelchair and foot traffic only.				
Disability Concerns	35	4.43	.70	
No Disability Concerns	41	3.90	.94	.008*
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.				
Disability Concerns	36	4.19	.92	
No Disability Concerns	41	3.95	.84	.228 n.s.
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.				
Disability Concerns	32	3.91	.69	
No Disability Concerns	41	3.78	.88	.509 n.s.
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.				
Disability Concerns	35	4.20	.80	
No Disability Concerns	41	4.07	.82	.498 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.				
Disability Concerns	35	3.89	.83	
No Disability Concerns	41	3.98	.88	.650 n.s.
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".				
Disability Concerns	34	3.85	.93	
No Disability Concerns	41	4.02	.85	.407 n.s.
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).				
Disability Concerns	35	3.91	.82	
No Disability Concerns	41	3.93	.72	.944 n.s.
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.				
Disability Concerns	36	4.36	.80	
No Disability Concerns	41	4.07	.85	.131 n.s.
Promotional materials should include specific information about trail facts and amenities.				
Disability Concerns	36	4.56	.50	
No Disability Concerns	41	3.98	.85	.001*
If site characteristics permit, the trail route should include topographic variation (elevation changes).				
Disability Concerns	38	3.82	.73	
No Disability Concerns	41	3.83	.92	.943 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.				
Disability Concerns	38	4.13	.74	
No Disability Concerns	39	3.62	.96	.010*
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.				
Disability Concerns	38	4.68	.53	
No Disability Concerns	41	4.29	.72	.007*
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional changes, as well as intersections.				
Disability Concerns	37	3.05	1.03	
No Disability Concerns	41	3.17	1.00	.612 n.s.
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or use of rolling dip water bars.				
Disability Concerns	32	3.44	.84	
No Disability Concerns	39	3.62	.91	.398 n.s.
Outsloping of trail should be just enough to permit water run-off with minimum cross-slope.				
Disability Concerns	34	3.68	.59	
No Disability Concerns	41	3.73	.78	.734 n.s.
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).				
Disability Concerns	36	4.11	.78	
No Disability Concerns	41	4.02	.82	.638 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.				
Disability Concerns	38	4.05	.87	
No Disability Concerns	41	4.05	.67	.982 n.s.
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.				
Disability Concerns	38	4.21	.81	
No Disability Concerns	41	4.07	.65	.406 n.s.
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.				
Disability Concerns	37	3.59	.69	
No Disability Concerns	39	3.79	.92	.288 n.s.
Trail and structures (especially rest stations) should be designed for maximum multi-sensory experience.				
Disability Concerns	38	4.13	.81	
No Disability Concerns	39	4.03	.87	.583 n.s.
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.				
Disability Concerns	37	3.81	.94	
No Disability Concerns	38	4.05	.77	.226 n.s.
All spaces and structures should be designed to be practical and user-friendly.				
Disability Concerns	36	4.47	.65	
No Disability Concerns	39	4.31	.73	.309 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.				
Disability Concerns	36	4.03	.84	
No Disability Concerns	39	4.13	.83	.606 n.s.
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.				
Disability Concerns	38	3.71	.80	
No Disability Concerns	39	4.13	.83	.028*
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.				
Disability Concerns	38	4.00	.81	
No Disability Concerns	39	3.90	.82	.582 n.s.
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.				
Disability Concerns	38	4.24	.71	
No Disability Concerns	37	4.27	.84	.853 n.s.
The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).				
Disability Concerns	38	3.89	.92	
No Disability Concerns	39	3.90	.85	.989 n.s.

Table A-7. One-way ANOVA Results of Kirkindall Principles by Visitor Disability Concerns Status.

Principle	Descriptive Statistics n	Mean	Std. Dev.	p
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.				
Disability Concerns	38	3.89	1.01	
No Disability Concerns	39	3.97	.87	.712 n.s.
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.				
Disability Concerns	38	4.24	.79	
No Disability Concerns	39	3.97	.78	.145 n.s.

$\alpha < 0.05$

Table A-8. Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	1	4.68	.57	79
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	2	4.48	.66	79
All spaces and structures should be designed to be practical and user-friendly.	3	4.39	.70	75
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.	4	4.31	.87	78
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	5	4.29	.72	77
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.	6	4.29	.76	78
Promotional materials should include specific information about trail facts and amenities.	7	4.25	.76	77
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	8	4.25	.77	75
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	9	4.23	.72	79
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	10	4.22	.89	79

Table A-8. Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	11	4.21	.83	77
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	12	4.18	.78	76
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	13	4.14	.73	79
Trail use should be restricted to wheelchair and foot traffic only.	14	4.14	.87	76
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.	15	4.13	.81	76
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.	16	4.10	.79	77
There should be a telephone at the trailhead for emergency use.	17	4.10	.99	78
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.	18	4.09	.70	79
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive..	19	4.08	.83	75
Trail and structures (especially rest stations) should be designed for maximum multi-sensory experience	20	4.08	.84	77
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).	21	4.06	.80	77

Table A-8. Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.	22	4.06	.88	77
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.	23	4.05	.77	79
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.	24	4.05	.92	77
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design concepts.	25	4.04	.81	79
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	26	4.03	.78	77
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.	27	3.95	.81	77
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	28	3.95	.88	75
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	29	3.94	.94	77
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.	30	3.93	.85	76

Table A-8. Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	31	3.93	.86	75
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	32	3.92	.76	76
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.	33	3.92	.84	77
The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	34	3.90	.88	77
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.	35	3.87	.89	77
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.	36	3.85	.98	79
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	37	3.84	.80	73
If site characteristics permit, the trail route should include topographic variation (elevation changes).	38	3.82	.83	79
Outsloping of trail should be just enough to permit water run-off with minimum cross-slope.	39	3.71	.69	75
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.	40	3.71	.87	77

Table A-8. Kirkindall Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	41	3.70	.82	76
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.	42	3.62	.89	77
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or use of rolling dip water bars.	43	3.54	.88	71
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional changes, as well as intersections.	44	3.12	1.01	78

Table A-9. Gamma Statistics for Kirkindall Principles.

Principle	Gamma Statistic
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	.723
Thorough and clear information re trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	.720
The potential for social interaction opportunities can be maximized at rest stations by providing wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	.712
Trail and structures (especially rest stations) should be designed for maximum multi-sensory opportunities.	.682
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	.670
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	.669
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	.658
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	.644
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	.632
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	.619
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	.614
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	.601

Table A-9. Gamma Statistics for Kirkindall Principles.

Principle	Gamma Statistic
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.	.594
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.	.590
All spaces and structures should be designed to be practical and user-friendly.	.581
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	.576
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.	.575
If site characteristics permit, the trail route should include topographic variation (elevation changes).	.568
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.	.567
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.	.554
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional changes, as well as intersections.	.548
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design concepts.	.531
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	.522

Table A-9. Gamma Statistics for Kirkindall Principles.

Principle	Gamma Statistic
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.	.517
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	.515
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.	.514
Outsloping of trail should be just enough to permit water run-off with minimum cross-slope.	.511
Promotional materials should include specific information about trail facts and amenities.	.510
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.	.499
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.	.486
There should be a telephone at the trailhead for emergency use.	.485
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.	.480
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).	.480
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.	.471
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.	.450

Table A-9. Gamma Statistics for Kirkindall Principles.

Principle	Gamma Statistic
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	.421
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or use of rolling dip water bars.	.417
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.	.410
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.	.378
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.	.375
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	.325
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	.290
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.	.253
Trail use should be restricted to wheelchair and foot traffic only.	.149

minimum acceptable gamma = 0.60

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.	1	4.68	.57	79
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.	2	4.48	.66	79
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designer, and resource managers.	3	4.42	.73	79
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.	4	4.41	.67	79
All spaces and structures should be designed to be practical and user-friendly.	5	4.39	.70	75
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.	6	4.39	.74	79
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature for all users.	7	4.31	.87	78
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.	8	4.29	.72	77
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretive opportunities.	9	4.29	.76	78
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.	10	4.29	.79	78

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Promotional materials should include specific information about trail facts and amenities	11	4.25	.76	77
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.	12	4.25	.77	75
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.	13	4.23	.72	79
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages and steep slopes	14	4.23	.75	79
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to backtrack.	15	4.22	.89	79
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.	16	4.21	.83	77
Benches and rest stations are a critical element of trail design.	17	4.21	.85	76
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.	18	4.18	.78	76
Planning and design needs to evolve with input from all user populations.	19	4.15	.85	78
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.	20	4.14	.73	79
Trail use should be restricted to wheelchair and foot traffic only.	21	4.14	.87	76

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.	22	4.13	.81	76
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points of the steepest grades.	23	4.10	.79	77
There should be a telephone at the trailhead for emergency use.	24	4.10	.99	78
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.	25	4.09	.70	79
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.	26	4.08	.83	75
Trail and structures (especially rest stations) should be designed for maximum multi-sensory experience.	27	4.08	.84	77
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).	28	4.06	.80	77
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.	29	4.06	.88	77
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.	30	4.05	.77	79
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses	31	4.05	.92	77
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design concepts.	32	4.04	.81	79

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.	33	4.03	.78	77
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.	34	4.01	.86	76
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.	35	3.95	.81	77
Trails should be designated by the Universal Symbol of Accessibility in conjunction with and explanation such as "This trail is accessible to all" or "A Universal Design Trail".	36	3.95	.88	75
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.	37	3.94	.84	79
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.	38	3.94	.89	77
Planners, designers, and resource managers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.	39	3.94	.90	79
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.	40	3.94	.94	77
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.	41	3.93	.85	76
Multi-sensory considerations should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.	42	3.93	.86	75

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).	43	3.92	.76	76
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.	44	3.92	.84	77
The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).	45	3.90	.88	77
Trail design should provide opportunities for visitors to make "hands-on" connections with the elements of a site.	46	3.88	.99	78
Design alternatives such as strategically spaces short plateaus can be used to mitigate steep slopes.	47	3.87	.89	77
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.	48	3.85	.98	79
Additional accessible parking can be provided by using a barrier-free, hard-packed surface for general parking.	49	3.84	.80	73
If site characteristics permit, the trail route should include topographic variation (elevation changes).	50	3.82	.83	79
Interpretive planning should incorporate tactile and auditory options.	51	3.78	.84	76
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone, "fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.	52	3.77	.77	78
There should be no minimum or maximum lengths for accessible trails.	53	3.76	.89	79

Table A-10. Combined Principles Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
Outsloping of trail should be just enough to permit water run-off with minimum cross-slope.	54	3.71	.69	75
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.	55	3.71	.87	77
Trail route and structures should be designed for visual vantage points in the 3 - 6 ft. range.	56	3.70	.82	76
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.	57	3.62	.89	77
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or use of rolling dip water bars.	58	3.54	.88	71
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional changes, as well as intersections.	59	3.12	1.01	78

Table A-11. Frequency Distribution of SFA Trail Evaluation Agreement Statement Responses.

Statement	Agreement					n
	strongly disagree	disagree somewhat	neither agree nor disagree	agree somewhat	strongly agree	
The parking area was adequate and appropriate to the setting.	0 0%	1 .9%	1 .9%	13 12%	93 86.1%	108 100%
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.	0 0%	0 0%	5 4.6%	21 19.4%	81 75%	107 99%
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.	0 0%	0 0%	8 7.4%	12 11.1%	86 79.6%	106 98.1%
The non-paved parking area could be used for additional disability parking if needed.	0 0%	5 4.6%	16 14.8%	44 40.7%	40 37%	105 97.2%
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.	0 0%	1 .9%	5 4.6%	24 22.2%	77 71.3%	107 99%
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.	0 0%	2 1.9%	4 3.7%	31 28.7%	69 63.9%	106 98.1%
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.	0 0%	2 1.9%	10 9.3%	20 18.5%	73 67.6%	105 97.2%

Table A-11. Frequency Distribution of SFA Trail Evaluation Agreement Statement Responses.

Statement	Agreement					n
	strongly disagree	disagree somewhat	neither agree nor disagree	agree somewhat	strongly agree	
The information provided did not diminish the element of adventure or discovery of the trail experience.	0 0%	2 1.9%	6 5.6%	31 28.7%	67 62%	106 98.1%
The trail map was helpful as well as easy to read and understand.	0 0%	1 .9%	4 3.7%	26 24.1%	72 66.7%	103 95.4%
The benches were comfortable.	0 0%	1 .9%	9 8.3%	23 21.3%	71 65.7%	104 96.3%
The number of benches/rest stations was adequate for the distance of the trail.	0 0%	1 .9%	1 .9%	14 13%	92 85.2%	108 100%
The benches/rest stations seemed to blend in with the natural features.	0 0%	3 2.8%	1 .9%	38 35.2%	64 59.3%	106 98.1%
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).	0 0%	1 .9%	1 .9%	28 25.9%	77 71.3%	107 99%
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.	0 0%	0 0%	9 8.3%	24 22.2%	74 68.5%	107 99%
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.	0 0%	0 0%	7 6.5	24 22.2%	75 69.4%	106 98.1%

Table A-11. Frequency Distribution of SFA Trail Evaluation Agreement Statement Responses.

Statement	Agreement					n
	strongly disagree	disagree somewhat	neither agree nor disagree	agree somewhat	strongly agree	
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.	0 0%	4 3.7%	15 13.9%	37 34.3%	52 48.1%	108 100%
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.	0 0%	2 1.9%	1 .9%	25 23.1%	79 73.1%	107 99%
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.	0 0%	0 0%	0 0%	26 24.1%	82 75.9%	108 100%
The amount and types of modification made for the trail seem adequate and appropriate to the setting.	0 0%	0 0%	4 3.7%	26 24.1%	78 72.2%	108 100%
The setting was an excellent choice for a nature trail.	1 .9%	0 0%	2 1.9%	13 12%	90 83.3%	106 98.1%
The trail surface was barrier-free, firm, stable, and provided good traction.	0 0%	0 0%	0 0%	18 16.7%	90 83.3%	108 100%
The trail surface had a natural appearance and blended well with the environment.	1 .9%	7 6.5%	5 4.6%	28 25.9%	66 61.1%	107 99%
The route of the trail provided a satisfying variety of scenery and topography.	0 0%	1 .9%	1 .9%	28 25.9%	78 72.2%	108 100%
The route of the trail followed the natural contours of the landscape.	0 0%	0 0%	1 .9%	19 17.6%	88 81.5%	108 100%
The trail was well integrated into the landscape.	0 0%	0 0%	1 .9%	23 21.3%	84 77.8%	108 100%

Table A-11. Frequency Distribution of SFA Trail Evaluation Agreement Statement Responses.

Statement	Agreement: strongly disagree	disagree somewhat	neither agree nor disagree	agree somewhat	strongly agree	n
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.	0 0%	2 1.9%	1 .9%	31 28.7%	74 68.5%	108 100%
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.	0 0%	0 0%	4 3.7%	27 25%	77 71.3%	108 100%
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.	0 0%	1 .9%	10 9.3%	30 27.8%	67 62%	108 100%
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).	0 0%	1 .9%	10 9.3%	32 29.6%	64 59.3%	107 99%
The cross-slope was never so steep as to cause difficulty or discomfort.	0 0%	1 .9%	9 8.3%	22 20.4%	76 70.4%	108 100%
The trail seemed to showcase the beauty and most positive aspects of the site.	0 0%	0 0%	5 4.6%	19 17.6%	82 75.9%	106 98.1%
The trail facilitated enjoyment of the special elements and features of the site.	0 0%	0 0%	7 6.5%	32 29.6%	69 63.9%	108 100%

Table A-11. Frequency Distribution of SFA Trail Evaluation Agreement Statement Responses.

Statement	Agreement					n
	strongly disagree	disagree somewhat	neither agree nor disagree	agree somewhat	strongly agree	
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.	0 0%	0 0%	2 1.9%	25 23.1%	81 75%	108 100%
The trail provides opportunities for quality outdoor experience with loved ones.	0 0%	0 0%	3 2.8%	20 18.5%	85 78.7%	108 100%
The trail helped me experience a sense of connection with nature.	0 0%	0 0%	7 6.5%	36 33.3%	65 60.2%	108 100%
I think anyone (with or without disabilities) could enjoy this trail.	0 0%	0 0%	2 1.9%	19 17.6%	87 80.6%	108 100%

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The parking area was adequate and appropriate to the setting.				
Disability Concerns	48	4.88	.49	
No Disability Concerns	60	4.80	.44	.406 n.s.
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.				
Disability Concerns	47	4.68	.63	
No Disability Concerns	60	4.73	.48	.626 n.s.
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.				
Disability Concerns	48	4.67	.69	
No Disability Concerns	58	4.79	.49	.275 n.s.
The non-paved parking area could be used for additional disability parking if needed.				
Disability Concerns	46	4.26	.77	
No Disability Concerns	59	4.03	.89	.173 n.s.
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.				
Disability Concerns	47	4.74	.49	
No Disability Concerns	60	4.58	.70	.180 n.s.
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.				
Disability Concerns	47	4.60	.65	
No Disability Concerns	59	4.56	.68	.780 n.s.

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.				
Disability Concerns	46	4.57	.65	
No Disability Concerns	59	4.56	.82	.968 n.s.
The information provided did not diminish the element of adventure or discovery of the trail experience.				
Disability Concerns	47	4.70	.62	
No Disability Concerns	59	4.41	.72	.028*
The trail map was helpful as well as easy to read and understand.				
Disability Concerns	45	4.67	.60	
No Disability Concerns	58	4.62	.62	.705 n.s.
The benches were comfortable.				
Disability Concerns	45	4.49	.73	
No Disability Concerns	59	4.64	.66	.259 n.s.
The number of benches/rest stations was adequate for the distance of the trail.				
Disability Concerns	48	4.73	.61	
No Disability Concerns	60	4.90	.30	.060 n.s.
The benches/rest stations seemed to blend in with the natural features.				
Disability Concerns	46	4.65	.60	
No Disability Concerns	60	4.45	.70	.121 n.s.
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).				
Disability Concerns	47	4.64	.64	
No Disability Concerns	60	4.73	.45	.368 n.s.

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.				
Disability Concerns	47	4.60	.68	
No Disability Concerns	60	4.62	.61	.868 n.s.
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.				
Disability Concerns	46	4.65	.60	
No Disability Concerns	60	4.63	.61	.875 n.s.
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.				
Disability Concerns	48	4.27	.89	
No Disability Concerns	60	4.27	.80	.980 n.s.
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.				
Disability Concerns	48	4.85	.36	
No Disability Concerns	59	4.56	.70	.009*
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.				
Disability Concerns	48	4.87	.33	
No Disability Concerns	60	4.67	.48	.012*
The amount and types of modification made for the trail seem adequate and appropriate to the setting.				
Disability Concerns	48	4.79	.46	
No Disability Concerns	60	4.60	.59	.067 n.s.
The setting was an excellent choice for a nature trail.				
Disability Concerns	47	4.94	.25	
No Disability Concerns	59	4.69	.70	.027*

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The trail surface was barrier-free, firm, stable, and provided good traction.				
Disability Concerns	48	4.83	.38	
No Disability Concerns	60	4.83	.38	1.00 n.s.
The trail surface had a natural appearance and blended well with the environment.				
Disability Concerns	47	4.72	.62	
No Disability Concerns	60	4.17	1.04	.002*
The route of the trail provided a satisfying variety of scenery and topography.				
Disability Concerns	48	4.85	.36	
No Disability Concerns	60	4.57	.62	.005*
The route of the trail followed the natural contours of the landscape.				
Disability Concerns	48	4.85	.41	
No Disability Concerns	60	4.77	.43	.285 n.s.
The trail was well integrated into the landscape.				
Disability Concerns	48	4.83	.38	
No Disability Concerns	60	4.72	.49	.177 n.s.
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.				
Disability Concerns	48	4.67	.52	
No Disability Concerns	60	4.62	.67	.671 n.s.
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.				
Disability Concerns	48	4.69	.47	
No Disability Concerns	60	4.67	.60	.844 n.s.

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.				
Disability Concerns	48	4.33	.78	
No Disability Concerns	60	4.65	.61	.019*
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).				
Disability Concerns	48	4.42	.74	
No Disability Concerns	59	4.54	.68	.362 n.s.
The cross-slope was never so steep as to cause difficulty or discomfort.				
Disability Concerns	48	4.50	.77	
No Disability Concerns	60	4.68	.60	.167 n.s.
The trail seemed to showcase the beauty and most positive aspects of the site.				
Disability Concerns	46	4.80	.45	
No Disability Concerns	60	4.67	.60	.198 n.s.
The trail facilitated enjoyment of the special elements and features of the site.				
Disability Concerns	48	4.69	.47	
No Disability Concerns	60	4.48	.70	.086 n.s.
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.				
Disability Concerns	48	4.77	.42	
No Disability Concerns	60	4.70	.53	.454 n.s.

Table A-12. One-way ANOVA Results of Trail Agreement Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The trail provides opportunities for quality outdoor experience with loved ones.				
Disability Concerns	48	4.90	.37	
No Disability Concerns	60	4.65	.55	.009*
The trail helped me experience a sense of connection with nature.				
Disability Concerns	48	4.73	.49	
No Disability Concerns	60	4.38	.67	.003*
I think anyone (with or without disabilities) could enjoy this trail.				
Disability Concerns	48	4.92	.28	
No Disability Concerns	60	4.68	.54	.007*

$\alpha < 0.05$

Table A-13. Frequency Distribution of SFA Trail Evaluation Importance Statement Responses.

Statement	Importance					n
	not at all	not very	somewhat	very	one of the most	
The parking area was adequate and appropriate to the setting.	0 0%	6 5.6%	25 23.1%	47 43.5%	29 26.9%	107 99%
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.	2 1.9%	6 5.6%	26 24.1%	42 38.9%	30 27.8%	106 98.1%
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.	2 1.9%	4 3.7%	12 11.1%	47 43.5%	39 36.1%	104 96.3%
The non-paved parking area could be used for additional disability parking if needed.	1 .9%	9 8.3%	36 33.3%	47 43.5%	11 10.2%	104 96.3%
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.	0 0%	3 2.8%	17 15.7%	55 50.9%	30 27.8%	105 97.2%
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.	0 0%	3 2.8%	21 19.4%	55 50.9%	25 23.1%	104 96.3%
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.	1 .9%	2 1.9%	20 18.5%	52 48.1%	29 26.9%	104 96.3%

Table A-13. Frequency Distribution of SFA Trail Evaluation Importance Statement Responses.

Statement	Importance					n
	not at all	not very	somewhat	very	one of the most	
The information provided did not diminish the element of adventure or discovery of the trail experience.	0 0%	11 10.2%	27 25%	41 38.0%	26 24.1%	105 97.2%
The trail map was helpful as well as easy to read and understand.	0 0%	3 2.8%	22 20.4%	44 40.7%	31 28.7%	100 92.6%
The benches were comfortable.	2 1.9%	8 7.4%	34 31.5%	30 27.8%	30 27.8%	104 96.3%
The number of benches/rest stations was adequate for the distance of the trail.	1 .9%	4 3.7%	29 26.9%	43 39.8%	30 27.8%	107 99%
The benches/rest stations seemed to blend in with the natural features.	1 .9%	3 2.8%	31 28.7%	43 39.8%	27 25.0%	105 97.2%
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).	1 .9%	8 7.4%	23 21.3%	44 40.7%	30 27.8%	106 98.1%
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.	2 1.9%	3 2.8%	26 24.1%	40 37.0%	35 32.4%	106 98.1%
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.	0 0%	4 3.7%	15 13.9%	46 42.6%	40 37.0%	105 97.2%

Table A-13. Frequency Distribution of SFA Trail Evaluation Importance Statement Responses.

Statement	Importance					n
	not at all	not very	somewhat	very	one of the most	
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.	2 1.9%	14 13.0%	37 34.3%	37 34.3%	17 15.7%	107 99%
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.	0 0%	1 .9%	14 13.0%	46 42.6%	45 41.7%	106 98.1%
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.	0 0%	0 0%	6 5.6%	30 27.8%	71 65.7%	107 99%
The amount and types of modification made for the trail seem adequate and appropriate to the setting.	0 0%	0 0%	5 4.6%	51 47.2%	49 45.4%	105 97.2%
The setting was an excellent choice for a nature trail.	0 0%	0 0%	2 1.9%	26 24.1%	77 71.3%	105 97.2%
The trail surface was barrier-free, firm, stable, and provided good traction.	1 .9%	2 1.9%	3 2.8%	37 34.3%	64 59.3%	107 99%
The trail surface had a natural appearance and blended well with the environment.	0 0%	1 .9%	15 13.9%	42 38.9%	48 44.4%	106 98.1%
The route of the trail provided a satisfying variety of scenery and topography.	0 0%	0 0%	6 5.6%	39 36.1%	62 57.4%	107 99%
The route of the trail followed the natural contours of the landscape.	0 0%	0 0%	15 13.9%	50 46.3%	42 38.9%	107 99%
The trail was well integrated into the landscape.	0 0%	0 0%	5 4.6%	48 44.4%	54 50.0%	107 99%

Table A-13. Frequency Distribution of SFA Trail Evaluation Importance Statement Responses.

Statement	Importance					n
	not at all	not very	somewhat	very	one of the most	
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.	1 .9%	3 2.8%	21 19.4%	49 45.4%	33 30.6%	107 99%
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.	1 .9%	3 2.8%	11 10.2%	54 50.0%	38 35.2%	107 99%
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.	1 .9%	3 2.8%	23 21.3%	46 42.6%	34 31.5%	107 99%
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).	1 .9%	5 4.6%	18 16.7%	42 38.9%	41 38.0%	107 99%
The cross-slope was never so steep as to cause difficulty or discomfort.	2 1.9%	4 3.7%	17 15.7%	41 38.0%	43 39.8%	107 99%
The trail seemed to showcase the beauty and most positive aspects of the site.	0 0%	0 0%	5 4.6%	47 43.5%	54 50.0%	106 98.1%
The trail facilitated enjoyment of the special elements and features of the site.	0 0%	1 .9%	10 9.3%	55 50.9%	41 38.0%	107 99%
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.	1 .9%	1 .9%	6 5.6%	43 39.8%	56 51.9%	107 99%

Table A-13. Frequency Distribution of SFA Trail Evaluation Importance Statement Responses.

Statement	Importance					n
	not at all	not very	somewhat	very	one of the most	
The trail provides opportunities for quality outdoor experience with loved ones.	0 0%	0 0%	8 7.4%	40 37.0%	59 54.6%	107 99%
The trail helped me experience a sense of connection with nature.	0 0%	1 .9%	7 6.5%	34 31.5%	65 60.2%	107 99%
I think anyone (with or without disabilities) could enjoy this trail.	0 0%	0 0%	4 3.7%	21 19.4%	82 75.9%	107 99%

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The parking area was adequate and appropriate to the setting.				
Disability Concerns	48	4.02	.93	
No Disability Concerns	59	3.85	.78	.299 n.s.
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.				
Disability Concerns	47	3.98	.90	
No Disability Concerns	59	3.78	1.00	.290 n.s.
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.				
Disability Concerns	47	4.17	.89	
No Disability Concerns	57	4.09	.91	.644 n.s.
The non-paved parking area could be used for additional disability parking if needed.				
Disability Concerns	45	3.71	.73	
No Disability Concerns	59	3.44	.90	.102 n.s.
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.				
Disability Concerns	47	4.11	.70	
No Disability Concerns	58	4.03	.79	.628 n.s.
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.				
Disability Concerns	47	4.00	.72	
No Disability Concerns	57	3.96	.78	.814 n.s.

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.				
Disability Concerns	46	4.09	.72	
No Disability Concerns	58	3.97	.86	.445 n.s.
The information provided did not diminish the element of adventure or discovery of the trail experience.				
Disability Concerns	46	3.83	.90	
No Disability Concerns	59	3.75	.98	.666 n.s.
The trail map was helpful as well as easy to read and understand.				
Disability Concerns	43	4.12	.70	
No Disability Concerns	57	3.96	.89	.357 n.s.
The benches were comfortable.				
Disability Concerns	45	3.87	1.04	
No Disability Concerns	59	3.66	1.01	.311 n.s.
The number of benches/rest stations was adequate for the distance of the trail.				
Disability Concerns	48	4.06	.93	
No Disability Concerns	59	3.78	.83	.100 n.s.
The benches/rest stations seemed to blend in with the natural features.				
Disability Concerns	46	3.93	.80	
No Disability Concerns	59	3.83	.91	.541 n.s.
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).				
Disability Concerns	47	4.04	.98	
No Disability Concerns	59	3.76	.90	.128 n.s.

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.				
Disability Concerns	47	4.13	.92	
No Disability Concerns	59	3.85	.93	.124 n.s.
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.				
Disability Concerns	46	4.35	.82	
No Disability Concerns	59	4.02	.78	.037*
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.				
Disability Concerns	48	3.63	1.02	
No Disability Concerns	59	3.39	.93	.216 n.s.
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.				
Disability Concerns	48	4.31	.78	
No Disability Concerns	58	4.24	.68	.617 n.s.
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.				
Disability Concerns	48	4.58	.65	
No Disability Concerns	59	4.63	.55	.707 n.s.
The amount and types of modification made for the trail seem adequate and appropriate to the setting.				
Disability Concerns	48	4.50	.58	
No Disability Concerns	57	4.35	.58	.194 n.s.
The setting was an excellent choice for a nature trail.				
Disability Concerns	47	4.74	.49	
No Disability Concerns	58	4.69	.50	.573 n.s.

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics			
	n	Mean	Std. Dev.	p
The trail surface was barrier-free, firm, stable, and provided good traction.				
Disability Concerns	48	4.67	.48	
No Disability Concerns	59	4.37	.87	.038*
The trail surface had a natural appearance and blended well with the environment.				
Disability Concerns	47	4.38	.71	
No Disability Concerns	59	4.22	.77	.265 n.s.
The route of the trail provided a satisfying variety of scenery and topography.				
Disability Concerns	48	4.50	.62	
No Disability Concerns	59	4.54	.60	.720 n.s.
The route of the trail followed the natural contours of the landscape.				
Disability Concerns	48	4.21	.71	
No Disability Concerns	59	4.29	.67	.553 n.s.
The trail was well integrated into the landscape.				
Disability Concerns	48	4.50	.62	
No Disability Concerns	59	4.42	.56	.507 n.s.
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.				
Disability Concerns	48	4.13	.87	
No Disability Concerns	59	3.95	.82	.284 n.s.
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.				
Disability Concerns	48	4.19	.73	
No Disability Concerns	59	4.15	.85	.822 n.s.

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics n	Mean	Std. Dev.	p
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.				
Disability Concerns	48	4.02	.84	
No Disability Concerns	59	4.02	.88	.982 n.s.
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).				
Disability Concerns	48	4.23	.88	
No Disability Concerns	59	3.98	.92	.163 n.s.
The cross-slope was never so steep as to cause difficulty or discomfort.				
Disability Concerns	48	4.23	.86	
No Disability Concerns	59	4.02	.99	.245 n.s.
The trail seemed to showcase the beauty and most positive aspects of the site.				
Disability Concerns	47	4.49	.55	
No Disability Concerns	59	4.44	.62	.674 n.s.
The trail facilitated enjoyment of the special elements and features of the site.				
Disability Concerns	48	4.35	.60	
No Disability Concerns	59	4.20	.71	.247 n.s.
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.				
Disability Concerns	48	4.50	.62	
No Disability Concerns	59	4.36	.80	.310 n.s.
The trail provides opportunities for quality outdoor experience with loved ones.				
Disability Concerns	48	4.58	.61	
No Disability Concerns	59	4.39	.64	.117 n.s.

Table A-14. One-way ANOVA Results of SFA Trail Importance Statements by Disability Concerns Status.

Statement	Descriptive Statistics			
	n	Mean	Std. Dev.	p
The trail helped me experience a sense of connection with nature.				
Disability Concerns	48	4.54	.62	
No Disability Concerns	59	4.51	.70	.798 n.s.
I think anyone (with or without disabilities) could enjoy this trail.				
Disability Concerns	48	4.73	.57	
No Disability Concerns	59	4.73	.49	.997 n.s.

$\alpha < 0.05$

Table A-15. SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
I think anyone (with or without disabilities) could enjoy this trail.	1	4.73	.52	107
The setting was an excellent choice for a nature trail.	2	4.71	.49	105
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.	3	4.61	.59	107
The route of the trail provided a satisfying variety of scenery and topography.	4	4.52	.60	107
The trail helped me experience a sense of connection with nature.	5	4.52	.66	107
The trail surface was barrier-free, firm, stable, and provided good traction.	6	4.50	.73	107
The trail provides opportunities for quality outdoor experience with loved ones.	7	4.48	.63	107
The trail seemed to showcase the beauty and most positive aspects of the site.	8	4.46	.59	106
The trail was well integrated into the landscape.	9	4.46	.59	107
The amount and types of modification made for the trail seem adequate and appropriate to the setting.	10	4.42	.58	105
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.	11	4.42	.73	107
The trail surface had a natural appearance and blended well with the environment.	12	4.29	.74	106
The design, materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.	13	4.27	.72	106

Table A-15. SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
The trail facilitated enjoyment of the special elements and features of the site.	14	4.27	.67	107
The route of the trail followed the natural contours of the landscape.	15	4.25	.69	107
The length of the trail seemed about right; adequate to provide a satisfying outdoor experience without being too demanding.	16	4.17	.79	107
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.	17	4.16	.81	105
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.	18	4.12	.90	104
The cross-slope was never so steep as to cause difficulty or discomfort.	19	4.11	.93	107
Steeper grades were made less challenging by the angle of the trail across slopes, well placed benches/rest stations, and/or the use of strategically placed plateaus and directional changes (modified switchbacks ... curves or bends in the trail on grade sections).	20	4.09	.91	107
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.	21	4.07	.75	105
The trail map was helpful as well as easy to read and understand.	22	4.03	.81	100
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.	23	4.03	.84	107
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.	24	4.02	.80	104

Table A-15. SFA Trail Importance Statements Rank-Ordered by Descending Mean Scores of Trail Visitors.

Principle	Descriptive Statistics			
	Rank	Mean	Std. Dev.	n
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.	25	4.02	.86	107
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.	26	3.98	.75	104
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.	27	3.97	.93	106
The parking area was adequate and appropriate to the setting.	28	3.93	.85	107
The number of benches/rest stations was adequate for the distance of the trail.	29	3.91	.89	107
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).	30	3.89	.94	106
The benches/rest stations seemed to blend in with the natural features.	31	3.88	.86	105
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.	32	3.87	.96	106
The information provided did not diminish the element of adventure or discovery of the trail experience.	33	3.78	.94	105
The benches were comfortable.	34	3.75	1.02	104
The non-paved parking area could be used for additional disability parking if needed.	35	3.56	.83	104
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.	36	3.50	.97	107

APPENDIX B

Summary of Design Standards for Accessible Recreation Trails

Summary of Design Standards for Accessible Recreation Trails

Americans With Disabilities Act Accessibility Guidelines, 1993.

	Easy (urban/rural)	Moderate (roaded natural)	Difficult (semi-primitive)	Most Difficult (primitive)
clear width (minimum)	48 inches	36 inches	28 inches	none
sustained running slope (maximum)	5 %	8.3 %	12.5 %	none
maximum grade allowed	10 %	14 %	20 %	none
---for max. distance of	50 feet	50 feet	50 feet	none
cross slope (maximum)	3 %	5 %	8.3 %	none
passing space interval (maximum)	200 feet	300 feet	400 feet	none
rest area interval (maximum)	400 feet	900 feet	1200 feet	none
rest areas at passing spaces	min. every other passing space	min. every third passing space	min. every third passing space	none
small level changes (Max with 1:2 bevel)	1 inch	2 inches	3 inches	none
surface	stable, firm, & slip-resistant	stable, firm, & slip-resistant	stable, firm, & slip-resistant	none

from Universal Access to Outdoor Recreation: A Design Guide, a 1993 publication of PLAE, Inc.

APPENDIX C

The Delphi Panel

THE DELPHI PANEL

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Austin, TX

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APPENDIX D

Delphi Materials

D - 1. STUDY OVERVIEW AND EXPLANATION

Thank you for participating in this study. Your cooperation is appreciated.

The following provides an overview of relevant information including:
- a brief study explanation or justification
- a brief statement of purpose
- procedures that will involve your participation as a Delphi Panel member

Specific instructions will accompany each questionnaire during the three rounds of the Delphi process.

EXPLANATION

To date, most efforts to increase accessibility in outdoor recreation settings have been in urban/rural settings with Easy accessibility levels. Thus parking facilities, visitor centers, fishing piers, day use/ picnic areas, and restrooms have been made more accessible along with the access paths connecting these elements. As the evolution in outdoor recreation continues, the focus is shifting to expand accessibility throughout the Recreation Opportunity Spectrum (ROS) to roaded natural settings and beyond.

Guidelines currently exist which specify minimum requirements for ADA compliance with respect to outdoor recreation. ADA and various agency guidelines stipulate *what* must be done to provide access in outdoor recreation settings, but little is written about *how* to actually implement these criteria, particularly in less developed settings. Increasing accessibility in a way that enhances visitor satisfaction (for *all* visitors) without dramatically compromising the natural character of the resource, is a particularly troublesome issue.

Pioneers in the field of accessible trail planning, design, and construction have striven to comply with legal requirements and provide quality recreation opportunities for both able-bodied visitors and visitors with disabilities while protecting the integrity of their recreation sites. Individually, their efforts have resulted in disjointed and incremental advances, but their collective experience offers valuable information for those who follow.

The **purpose of this study** is to consolidate the knowledge, experience, and recommendations of leading experts into a set of guidelines which demonstrate how to apply ADA criteria to the construction of new trails. The focus is *not* on rules, regulations, requirements, or the logistics of measurement, but rather, on the practical principles regarding application of these criteria.

In other words, **what are the common-sense, practical guidelines or "rules of thumb" that can be used to apply ADA criteria in the creation of universally accessible nature trails that are both user- and site-friendly?**

THE DELPHI METHOD

In many instances where decisions require knowledge which is not readily available, decision-makers rely on the opinions of experts. Delphi was the name of a meeting site in Ancient Greece where Oracles (people through whom a deity was believed to speak) met, held discussions, and gave wise or authoritative decisions or opinions. The Delphi process uses a series of questionnaires to aggregate the judgments and opinions from a selected group of experts who are knowledgeable about the issue under study.

Twenty panel members have been selected nationwide from among resource managers, recreation management researchers, recreation design specialists, accessibility advocates, and others with experience, expertise, and/or interest in the development of universally accessible trails.

The Delphi process will be conducted in four rounds to define, clarify, and prioritize the issues. Panelists will not be required to attend any meetings. Participation should require no more than 2-3 hours during each round. All responses will be completed in anonymity at the convenience of panel members. Communications between the researcher and the panelists will be conducted via U.S. postal system, amplified by e-mail for administrative matters (clarification, etc.). It is anticipated that six - eight weeks should be sufficient to complete the Delphi process. Panelists will be given one week to respond in each round. The assessment and organization of each round's results will be processed within one week by the researcher.

Round 1 will be an open-ended questionnaire which asks participants to describe:

- their experiences with accessible projects
- difficulties or problems encountered
- successful and unsuccessful strategies
- most useful references and sources of information
- the issues and concerns relevant to application of accessibility criteria to nature trails in roaded natural settings

In **Round 2** participants will be asked to:

- challenge
- discuss
- clarify
- revise
- amend
- prioritize issues and concerns of *all* panelists from the first round.

In **Round 3**, for further refinement, the procedures of the second round will be repeated.

In **Round 4**, panelists will approve and rank final principles.

Results of the Delphi process will be used to develop a practical planning, design, and construction guide for universally accessible nature trails. Emphasis will be placed on how to comply with both the letter *and* the spirit of ADA, while simultaneously providing quality recreation opportunities for the broadest possible spectrum of people and protecting the character and integrity of the recreation resource.

D - 2. GENERAL INFORMATION AND TIPS

Here are a few general points to ponder as you address the issues. Some definitions and specifications are enclosed separately for your convenience; however, there are several parameters I'd like to emphasize before you begin the first round of the Delphi process. You may want to keep the materials in this packet handy for reference.

It is not the scope of this study to define principles for *every* trail, but rather, to provide useful information that can be applied in the creation of new nature trails which fall within the parameters of the following **objectives**:

Provide *universal accessibility* while:

1. minimizing social as well as physical barriers for visitors with disabilities
2. minimizing creation of aesthetic barriers or detractors
3. preserving and protecting the character and integrity of the resource

1. **Universal Access,** as applied here, does *not* mean universal use. The idea is to accommodate the broadest possible spectrum of people, *not* the broadest spectrum of uses .... we're talking trails for foot traffic and wheelchairs (or other mobility aids). Combining accessibility issues with multi-use recreation trails for dirt bikes, horses, in-line skates, skateboards, motorcycles, snowmobiles, and other ORVs is *not* within the purview of this study.

Our focus is on providing people access to nature.

2. A **Recreation Trail** provides access to a site's lesser developed, *natural* elements and is typically more than 1/4 mile in length. Consider elements associated with traditional nature trails, as well as guided and self-guided interpretive trails. That is, consider trails 1/4 to 1 1/2 miles in length that provide visitors direct contact with the natural environment and opportunities for observing special features, differing seasonal experiences, natural contours in topography, personal reflection, multi-sensory experience, and maximum variation in interpretative potential.

3. With respect to **interpretation**, our focus is on the most basic fundamentals of planning, design, and construction. Beyond interpretive considerations which may be required for visitor safety and orientation, the efficacy of various interpretive formats and programming are not germane to this study. At issue is not so much what types of interpretation should be done, but how interpretive opportunities can be incorporated into the trail design to provide a variety of quality *opportunities* for trail visitors to connect with or experience nature to the best of their own abilities.

4. Please consider suggestions as they may be applied to **Universally Accessible*** nature trails with **Moderate*** levels of difficulty in **Roaded Natural*** settings (*described in "Definitions and Specifications"). Though our focus is specific, and the scope is narrow, the concept and study results may well have broader implications. This information may not only provide a framework for trails in this category, but may also apply to trails with greater levels of difficulty in other settings.

5. Keep the **integrity of the site** as a primary consideration. As the evolution in outdoor recreation continues, the focus is shifting to expand accessibility in the ROS to roaded natural settings and beyond. Each step in the spectrum presents greater challenges not only to trail users, but to trail planners, designers, and builders. Determination of the degree of accessibility and factors which dictate the application of

standards are based upon classification of setting, type of access, and difficulty level rating - all defined primarily in terms of perceivable modifications to the natural environment. You are asked to consider how to increase accessibility in ways that can enhance visitor satisfaction (for *all* visitors) without dramatically compromising the natural character of the resource.

6. The **Delphi Panel** consists of experts from around the nation with a broad range of experience and areas of expertise. It is not essential that your experience specifically include work on trails. All panelists have been selected for potential to contribute valuable insights from their particular perspectives. So whether you've planned, designed, or built accessible trails, administered or managed sites where accessible trails have been built, served in an administrative or supervisory capacity in agencies responsible for providing accessible trails, served on regulatory committees, public service boards, or other accessibility advocacy forums, your input is welcomed. You are all trail advocates concerned about improving and expanding accessibility in outdoor settings.

To promote and support free thought and expression, **anonymity** for panelists will be maintained during the three Delphi rounds. All issues will be categorized under the headings of **Planning, Design, and Construction**, so it may be helpful to organize your thoughts along those lines. You'll have three opportunities to review and revise your comments in conjunction with input from of the rest of the panel, as well as to comment on, revise, and prioritize the recommendations of the entire panel.

The most basic thing to remember is that you are being asked to provide common-sense, practical information that you believe would be most useful to people facing the challenge of creating new universally accessible nature trails. Your task is to reach a consensus on issues, concerns, opinions, and value judgments. From this consensus will be derived a general philosophy or set of principles by which the application and implementation of standards may be directed.

D - 3. DEFINITIONS AND SPECIFICATIONS

The following definitions and specifications are offered for clarification and standardization. from Universal Access to Outdoor Recreation: A Design Guide, a 1993 publication of PLAE, Inc.; and Trails Management Handbook, FSH 2309.18, a 1985 publication of USDA Forest Service.

Recreation Opportunity Spectrum (ROS): A framework for stratifying and defining classes of outdoor recreation environments; based on a continuum of possible combinations of recreation settings, activities, and experiential opportunities; divided into four basic categories: **urban/rural**; **roaded natural**; **semi-primitive**; and **primitive**. The ROS also explicitly organizes accessibility as a primary recreation expectation with different ratings for levels of difficulty: **easy**, **moderate**, **difficult**, and **most difficult**. Each category and rating has its own level of accessibility as well as visitor expectations (see table).

Recreation Trails: typically exceed 1/4 mile in length and provide access to lesser-developed elements and spaces of a recreation site where natural features are emphasized. Where other more developed activities or elements do not exist, the Recreation Trail is often the primary attraction of a site.

Nature Trails- typically 1/4 to 1 1/2 miles in length, providing visitors direct contact with the natural environment and opportunities for observing special features, differing seasonal experiences, and natural contours in topography

Interpretive Trails- (Guided and self-guided) typically the same as nature trails with an added emphasis on provision (in various formats) of information about the site's natural, geologic, historical, and/or cultural significance

Roaded Natural Recreation Setting: A moderately developed recreation area in which structural modifications have been made but are not extensive, and such modifications emphasize the use of natural materials and preservation of natural features. Visitors expect a moderate level of accessibility.

Moderate Level of Accessibility: The general level of expected access to elements and spaces integrated into moderately developed recreation sites or portions of sites. These are typically in roaded natural settings.

Universal Design: A philosophical approach to accessible design that combines the basic principle of barrier-free design with the comprehensive view of the human being suggested by the Enabler Model. The Enabler Model considers 15 different disability concerns, categorized in terms of mental functions, the senses, and motor impairment. It also considers "invisible" disabilities like lack of stamina and extremes of size and weight. Universal design considers anthropometrics, spatial requirements and other needs of people with disabilities and accommodates these needs in a fashion that also addresses the abilities and needs of the able-bodied population, incorporating features designed to accommodate both groups.

Accessible: The term "accessible" is used to describe a site, building, facility, or portion thereof that complies with ADA guidelines and can be approached, entered, and used by physically disabled people (in accordance with the expectations of accessibility evoked by the setting's location on the Recreation Opportunity Spectrum.)

Summary of Design Standards for Accessible Recreation Trails. Americans With Disabilities Act Accessibility Guidelines, 1993.

	Easy (urban/rural)	Moderate (roaded natural)	Difficult (semi-primitive)	Most Difficult (primitive)
clear width (minimum)	48 inches	36 inches	28 inches	none
sustained running slope (maximum)	5 %	8.3 %	12.5 %	none
maximum grade allowed	10 %	14 %	20 %	none
---for Max. distance of	50 feet	50 feet	50 feet	none
cross slope (maximum)	3 %	5 %	8.3 %	none
passing space interval (maximum)	200 feet	300 feet	400 feet	none
rest area interval (maximum)	400 feet	900 feet	1200 feet	none
rest areas at passing spaces	min. every other passing space	min. every third passing space	min. every third passing space	none
small level changes (Max. with 1:2 bevel)	1 inch	2 inches	3 inches	none
surface	stable, firm, & slip-resistant	stable, firm, & slip-resistant	stable, firm, & slip-resistant	none

Clear: Unobstructed
Running Slope: The slope that is parallel to the direction of travel.
Sustained Running Slope: On average, the percent slope over the length of the trail.
Maximum Grade: Segments of recreation trails where the slope is steeper than the maximum allowed sustained running slope.
Cross Slope: The slope that is perpendicular to the direction of travel.
Passing Space: When recreation trails are less than 60 inches in clear width, a minimum space of 60 inches by 60 inches must be located at specified intervals along the trail to provide places for rest and safe passing.
Rest Area: In roaded natural settings, benches and other types of fixed seating should be provided at specified intervals.
Small Level Changes: Small vertical changes in surface level. Vertical changes must be beveled with a slope of no greater than 1:2 so that such changes do not create barriers to accessibility, given the expected level of accessibility associated with the setting.

Surface: Trail tread composed of materials which are aesthetically appropriate and commensurate with user expectation. All surface materials should be firm, stable, and slip-resistant.

D - 4. Instructions -- Round 1

INTRODUCTION:

There are two separate components in Round I. Both components are open-ended. Unlike traditional questionnaires where you are given specific questions, here you will create your own questions or issues. What's relevant for further discussion and refinement will be determined by contributions of all members of the panel. The researcher will compile all comments and submit them to panelists for clarification, elaboration, and prioritization in Round 2.

Panelists with trail experience are asked to complete both sections.

Panelists with no specific trail experience may begin with Round 1; Section 2.

Section 1 is dedicated to troubleshooting matters. This portion of the Delphi will be done *only* in the first round, but you may add to your comments in later rounds. Resource managers who have contended with, or corrected, faulty planning, design, or construction strategies may want to elaborate on administration or maintenance issues in this section.

Section 2 focuses on issues and concerns associated with implementing ADA criteria on trails in less developed sites.

Be thorough but concise. Sign and return your information in the self-addressed, stamped envelope. Please observe the "Mail by" date at the top of the questionnaire form. Feel free to contact the researcher if you have questions.

INSTRUCTIONS:

Round 1; Section 1
Accessible Trail Troubleshooting:
Descriptions, Problems, Solutions, References

The objective is to develop a body of information that can serve as a general trouble-shooting guide for planners, designers, and builders of accessible trails.

You are asked to:

- briefly describe the number and types of accessible trail projects with which you've been involved; include a statement about your role(s) with those projects
- briefly discuss the types of problems (or most instructive situations) encountered
- briefly describe the solutions or most effective strategies employed to overcome those problems
- briefly discuss post-construction management or maintenance problems resulting from faulty or inadequate planning, design, or construction practices; include a brief discussion of corrective measures and suggestions
- list references and sources of information that were useful to you.
- References need not be listed in any particular order and should include *all* useful sources (published or informally communicated)

Round 1; Section 2
Accessible Trail Issues & Concerns:
Issues, Concerns, Explanations, Opinions, & Applications

Development of a general philosophy or set of principles will begin with identification of the issues and specific concerns relevant to those issues. Your opinions on the most practical means to address each concern will contribute to discussion and consensus.

You are asked to:

- identify the issues
- list specific related concerns
- provide a brief explanation of your concerns along with your opinion of the most practical and efficient means of addressing those concerns
- support your perspective with examples for potential application

Identify the issues that you see as crucial for consideration (e.g.: site protection, aesthetics, challenge levels, maintenance, etc.). List and briefly explain your concerns with respect to each issue. Express your opinion about what you think can or should be done to address these concerns. Provide specific examples that demonstrate potential application of your recommendations.

Issues and concerns need not be listed in any particular order; however, you are asked to categorize them under the headings of Planning, Design, and Construction. They will be revised and prioritized in the second and third rounds of the Delphi process. List as many as you can think of in the first round, but remember that you will be able to add to and revise your list in subsequent rounds. You'll also have the opportunity to comment, express opinions, or make suggestions regarding input from other panelists.

Be succinct, but qualify, quantify, and elaborate as you feel necessary. Your elaboration will provide a basis for comments from other panelists. Explaining the rationale behind your opinions will be especially important in situations where there may be disparate opinions among panelists.

D - 5. Instructions -- Round 2

INTRODUCTION:

Your assignment for Round 2 is to assess each opinion. You are also asked to consider a list of additional issues and to add others that you may have thought of since Round 1. Use the same format for this portion of Round 2 that you used in Round 1 (a template is provided).

All information submitted in Round 1 has been arranged by Issues. Each has a number of concerns, opinions, and suggestions for applications. Similar ideas have been consolidated, but where disparate opinions or concerns were offered on the same issues, all perspectives have been included for your consideration.

> Please remember that we are attempting to define **qualitative** principles for universally accessible nature trails. Our focus does not include recommendations for the use of any specific set of rules, requirements, or regulations. We are not concerned with the logistics of measurement or interpretative programming, methods, or materials. All interpretation issues are addressed (through trail planning, design, and construction) under the heading "Facilitating Visitor Connection With the Site".

Round 2 materials are divided into 2 sections: OPINION ASSESSMENT/NEW ISSUES and APPENDICES. Use Appendices for information underlying the opinions, and keep them for future reference.

You will return only the Opinion Assessment and New Issues forms.

INSTRUCTIONS

Opinion Assessment:

- Read the opinions carefully.
- Assess your level of agreement (or disagreement) with each opinion by marking a point on the agreement continuum scale.
- If you disagree, or would like to suggest revisions, use the Comment space to explain and support your position. If there are some components of an opinion with which you can agree, suggest a compromise. The goal is to reach a consensus.

New Issues:

- Read the list of Additional Issues and state concerns and opinions you have about any topic on the list.
- If there are issues that are not included on this list and were not addressed by other panelists in Round 1, you may add them now.
- For all additional or new issues, use the same format as Round 1 (New Issues template provided).
- **Please sign and mail your Round 2 response by Friday, June 19**.
  In a deadline pinch, you can fax to me at 409-468-2489.

D - 6. Additional Issues

Use the New Issues Form to express concerns or state an opinion about any (or all) of the following topics:

- Minimizing or Mitigating Aesthetic Impacts of Accessible Accommodations
- Maximizing Functionality of Accessible Accommodations
- Benches/Rest Station Areas
- Providing Opportunities for Sensory Experience (besides visual and tactile)
- Mitigating Degree of Difficulty of Slopes
- Creative Options for Flush Drainage
- Trail Site Selection Criteria
- Recommendations for Minimum/Maximum Parameters for Trail Length
- Trail Configuration (linear, loop, stacked loop, satellite loop, etc.)
- Social Integration for Visitors With Disabilities
- Multiple-use vs. Restricted Use Trails
- Combating Vandalism Through Accessible Design
- Using the Application of Accessible Accommodations to Enhance the Trail Experience for All Visitors
- Other new issues?

D - 7. Instructions -- Round 3

INTRODUCTION:

The opinions in this round reflect the statements and revisions from previous rounds.

Your assignment is to assess each opinion, just as you did in Round 2. Please note that *both sides* of the paper are printed.

Round 3 materials are divided into 2 sections: OPINION ASSESSMENT and an APPENDIX. Use the Appendix to review opinions and comments submitted in the previous rounds.

You will return only the Opinion Assessment form.

INSTRUCTIONS:

Opinion Assessment:

- Read the opinions carefully.
- Assess your level of agreement (or disagreement) with each opinion by circling a number on the agreement continuum scale.
- Use the Comment space to explain and support your position if you disagree, or agree but would like to suggest revisions. If there are some components of an opinion with which you can agree, suggest a compromise. The goal is to reach a consensus.

Appendix:

- Refer to the Appendix to review the opinions as originally stated in Round 1, as well as, the comments submitted in Round 2 about those opinions.

Please sign and mail your Round 3 Opinion Assessment form by Monday, July 13.

In a deadline pinch, you can fax to me at 409-468-2489.

D - 8. Instructions -- Round 4 Principle Approval and Ranking

INTRODUCTION:

The principles stated here reflect the comments and revisions derived from three rounds of discussion.

Your assignment is to approve (or reject) the principles and assign a level of significance to each.

> For a principle to be included in the study conclusions, there must be consensus among *all* panelists.

Therefore, ***each*** panelist has the power to affect the outcome with ***every*** opinion.

If you disagree completely with a principle, by all means disagree, and check the "Do Not Include as a Principle" box. However, if you partially agree with a principle, or object to its application or scope (too narrow or too broad) as presented, consider whether your objections are strong enough to eliminate the principle altogether. In some instances, you may have to decide whether it's better to have a principle that partially represents a particular issue, or have no principle at all.

Please note that *both sides* of the paper are printed.

INSTRUCTIONS:

Principle Approval and Ranking

- Please read the principles *carefully*.
- Mark your approval (or rejection) of each principle by placing an x in the box above the statement that most accurately reflects your opinion.
- Mark only one box for each principle.

Please sign and mail your Approval and Ranking Form by Monday, August 10.

In a deadline pinch, you can fax to me at 409-468-2489.

APPENDIX E

Survey Questionnaires

E -1. Trail User Information Form

1. **Name:** (first name only) _____ **Date:** _____

2. **Residence:** City _____ State _____ Zip _____

3. **Occupation:** _____
(if retired, please state former occupation)

4. **Gender:** ☐ Male ☐ Female

5. **Ethnic origin:** ☐ African American ☐ Asian American ☐ Caucasian
☐ Hispanic ☐ Native American ☐ Other _____

6. **Age:** ☐19 and under ☐ 20 -34 ☐ 35-49 ☐ 50-64
☐ 65-79 ☐ 80 and up

7. **What is your trail use/hiking experience?**
☐ Frequent, 10 or more times per year ☐ Often, 5 - 9 times per year
☐ Seldom, 1-4 times per year ☐ Infrequently, less than once per year ☐ Never

8. **For what purpose(s) do you usually use trails?**
☐ Health/exercise ☐ Recreation ☐ Relaxation
☐ Wildlife observation ☐ Spiritual renewal ☐ Nature study
☐ Other _____

9. **Do you (or a loved one with whom you use / or would like to use nature trails) have a limitation impairment, or disability?**

Check all that apply	Self	Other*	(*If other, please state relationship)	State the nature of the limitation, impairment, or disability
☐ sensory ☐ hearing impaired ☐ sight impaired ☐ other sensory impairment	☐	☐		
☐ mobility ☐ wheelchair ☐ walker ☐ cane ☐ crutches	☐	☐		
☐ intellectual/mental	☐	☐		
☐ chronic disease or illness	☐	☐		

10. **What factors limit your use of accessible nature trails?**

Check all that apply
☐ have no interest in using accessible trails
☐ distance to accessible trails from home
☐ know of no other accessible trails
☐ accessible trails I know of are not suitable; (if unsuitable, please explain):
☐ other (please describe)

11. **Please list other accessible nature trails which you have.....**

Heard of	Used	Trail Name	Location/Agency
☐	☐		
☐	☐		
☐	☐		
☐	☐		

E -2. Principle Evaluation Form

APPLICABLE PRINCIPLES FOR UNIVERSALLY ACCESSIBLE NATURE TRAILS ASSESSMENT FORM

Thank you for taking time to participate in this study. Researchers are looking at the issues associated with creating accessible trails in natural settings. The following survey statements represent the perspectives of a number of experts from around the country. Your opinions are very important and will be used to evaluate these principles.

***All* Statements Pertain Specifically and Exclusively to Universally Accessible Nature Trails.**

The following definitions and specifications are offered for clarification.

Nature Trails: Typically 1/4 to 1 1/2 miles in length, providing visitors direct contact with the natural environment and opportunities for observing special features, differing seasonal experiences, and natural contours in topography.

Universal Design: A philosophical approach to accessible design that combines the basic principle of barrier-free design with the comprehensive view of the human being suggested by the Enabler Model. The Enabler Model considers 15 different disability concerns, categorized in terms of mental functions, the senses, and motor impairment. It also considers "invisible" disabilities like lack of stamina and extremes of size and weight. Universal design considers anthropometrics, spatial requirements and other needs of people with disabilities and accommodates these needs in a fashion that also addresses the abilities and needs of the able-bodied population, incorporating features designed to accommodate both groups.

{from Universal Access to Outdoor Recreation: A Design Guide, a 1993 publication of PLAE, Inc.; and Trails Management Handbook, FSH 2309.18, a 1985 publication of USDA Forest Service}

Please indicate:
(a). your level of agreement and
(b). the importance to your overall trail experience for each of the following.

PRINCIPLES	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
EXAMPLE										
Statement of the principle: mark BOTH agreement and importance for each item, please.	X								X	
PLANNING										
The access potential of a site should not be limited or determined exclusively by the Recreation Opportunity Spectrum (ROS), a system of classifying levels of development.										
Providing full-spectrum accessibility entails offering an array of environmental experiences through a variety of trail choices.										
The segregating effects of "special" trails for people with disabilities can be avoided by using universal design concepts.										
Planners, designers, and resource managers should begin with the presumption that all trails will be accessible to the greatest extent possible within the constraints of the natural environment.										
Accessibility issues need to be incorporated into site and facility planning as an integral part of initial considerations.										
Care should be taken during planning, design, and construction to minimize impact (or at least the appearance of modification) to both the physical features and aesthetic qualities of the site.										
Information on design principles, construction techniques, and materials needs to be made available to trail planners, designers, and resource managers.										
Concerted efforts should be made to educate, inform, and promote communication, collaboration, and cooperation between all parties involved in all phases of a trail project.										
Planning and design needs to evolve with consumer input from all user populations.										
Planners, designers, and resource managers have a responsibility to facilitate the exchange of information and ideas with consumers and lay advisors.										
Trails should be planned and designed to serve the broadest spectrum of human abilities, not the broadest spectrum of activities or uses.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement 1

PRINCIPLES	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
Sites/routes should be selected on the same basis as any other nature trail but with the added consideration that the universal design criteria can be met.										
Site/route selection should focus on areas with maximum potential for multi-sensory experience and interpretative opportunities.										
Interpretive planning should be multi-faceted and parallel the planning and design of the physical aspects of the trail.										
Interpretive planning should incorporate tactile and auditory options.										
DESIGN										
Trail design should provide opportunities for visitors to make "hands on" connections with the elements of a site.										
Loop trails are a more user-friendly configuration than linear trails because they permit directional choice and eliminate the need to back track.										
The directional choice factor of loop trails can be especially important at sites with steeper grades where uphill and downhill directional preference can be different for walkers and wheelchair users.										
A trail's primary loop should be at least 1/2 mile but no more than 1 1/2 miles in length.										
Additional loops and spurs can be stacked or linked to primary loop offering greater distance and levels of challenge while still utilizing universal design principles.										
There should be no set minimum or maximum lengths for accessible trails.										
A nature trail should do more than provide opportunity for a connection with nature, it should facilitate it. Even if there's no interpretive signing, brochures, or programming... the trail itself, (its design and structures) should compel engagement with nature.										
SAFETY										
There should be a telephone at the trailhead for emergency use.										
Vehicular access (for maintenance and emergency vehicles) should be available but unobtrusive to (or unapparent from) the immediate trail area.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 2

PRINCIPLES	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
Effort should be made to build safety into the trail without sacrificing either the integrity of the site or the element of challenge.										
Trail use should be restricted to wheelchair and foot traffic only.										
PARKING										
To prevent unauthorized use, accessible accommodations in the parking area should be overstated; for example, reserved spaces should be designated by word signs, symbols, and painted lines.										
The parking surface (beyond the required number of reserved dimensioned spaces) should be a barrier-free, hard-packed material.										
Additional accessible parking can be provided by using a barrier-free, hard packed surface for general parking.										
Dimensioned (painted & reserved) disability parking spaces should be van accessible with ample (greater than minimum) access isles on both sides.										
Except for the parking area, accessible accommodations should be designed to blend or integrate with general accommodations and the environment, and should not be signed or designated for disabled access.										
SIGNS & BROCHURES										
Trails should be designated by the Universal Symbol of Accessibility in conjunction with an explanation such as "This trail is accessible to all" or "A Universal Design Trail".										
Factual description of trail characteristics should be utilized in place of subjective challenge ratings (Easy, Moderate, Difficult).										
Facts regarding trail conditions, length, width, percent grade, cross-slope, and surface should be posted at trailheads.										
Thorough and clear information giving trail facts (length, width, grade, cross-slope, & surface) should be available at the trailhead so that visitors can make informed decisions about their abilities and the challenges of the trail.										
Promotional materials should include specific information about trail facts and amenities.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 3

PRINCIPLES	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
TOPOGRAPHY										
If site characteristics permit, the trail route should include topographic variation (elevation changes).										
Using well-designed bridges and boardwalks enhances the access potential of trails along drainages in steep terrain.										
Design alternatives such as strategically spaced short plateaus can be used to mitigate steep slopes.										
SURFACE										
Surface material should provide adequate traction, low maintenance, and durability in most weather conditions, as well as natural appearance and aesthetic appeal.										
Concrete and asphalt have a proven history as accessible trail surfaces; however, alternative surface materials such as limestone,"fines", crushed granite, steel slag, and others may provide a more natural appearance without sacrificing safety or durability.										
Changes in surface texture (such as grooves, ridges, inlaid stones, bricks, or other surface variations) should be used to designate/indicate location of benches/rest stations, interpretive stops, and sharp directional and grade changes, as well as trail intersections.										
Water drainage and erosion control can be facilitated without elevated water bars or surface crowning by outsloping and/or the use of rolling dip water bars.										
Outsloping of trail surface should be just enough to permit water run-off with minimum cross-slope.										
Trail width should be just wide enough for two wheelchairs to pass side by side comfortably (between 5 ft. and 6 ft.).										
Rest stations, interpretive stops, pull-outs, and turn-arounds are spaces that can be widened to permit passing and gathering.										
All wide areas should be located with consideration for landscape contours and other variables so that they are well integrated into the overall design of the trail and the natural features of the area.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 4

PRINCIPLES	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
BRIDGES, BENCHES/REST STATIONS (STRUCTURES)										
Trail route and structures should be designed for visual vantage point heights in the 3 - 6 ft. range.										
Trail and structures (especially rest stations) should be designed for maximum multi-sensory opportunities.										
Multi-sensory consideration should also include phenomena such as temperature variations (mini-climes, sun/shade), avenues of prevailing breezes, and season-specific weather, wildlife, and habitat characteristics.										
All spaces and structures should be designed to be practical and user friendly.										
Foundations and substructures should be "over-built" (exceed minimum design standards) so that accommodations are substantial and solid without being visibly obtrusive.										
Benches and rest stations are a critical element of trail design.										
To maximize opportunities for solitude and quiet reflection, benches/rest stations should be located where visual contact between stations is not possible.										
Because rest stations are more than places to rest (they also provide opportunities for quiet individual reflection, social interaction, and aesthetic appreciation of special natural features), a variety of form and function in rest station placement and configuration should be provided.										
Benches/rest stations should be located and oriented with consideration for natural features and multi-sensory opportunities.										
The potential for social interaction opportunities can be maximized at rest stations by providing multiple wheelchair spaces which are oriented beside, as well as facing, other wheelchair spaces and fixed seating (benches).										
Bench design should supersede basic function; benches should be more than just a place to sit, they should be comfortable.										
The degree of difficulty of trail grades can be mitigated (giving visitors places to rest where they are most likely to need them) by placing rest stations closer together and at or near mid-points and high points of the steepest slopes.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 5

E -3. SFA Trail Evaluation Form

TRAIL EVALUATION	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
EXAMPLE										
Statement about the trail: mark **BOTH** agreement and importance for each item, please.	X								X	
PARKING										
The parking area was adequate and appropriate to the setting.										
Indicators for reserved disability parking were adequate to discourage unauthorized use without detracting too much from the "natural feel" of the setting.										
Reserved accessible spaces were conveniently located and large enough to provide safe and comfortable movement of people, adaptive equipment, and mobility aids on both sides of parked vehicles.										
The non-paved parking area could be used for additional disability parking if needed.										
BROCHURES										
The promotional brochure (the yellow one) provided adequate information for me to be aware of the location, amenities, and unique features of the site.										
The promotional brochure provided adequate information for me to know what kind of trail experience and challenge to expect.										
Adequate facts about the trail were provided in the loop brochure (the gray one) for me to make a well-informed decision about the challenges of the trail and my level of ability.										
The information provided did not diminish the element of adventure or discovery of the trail experience.										
The trail map was helpful as well as easy to read and understand.										
BRIDGES, BENCHES/REST STATIONS (STRUCTURES)										
The benches were comfortable.										

Mark opinions on AGREEMENT *and* IMPORTANCE for each statement. 1

TRAIL EVALUATION

	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
The number of benches/rest stations was adequate for the distance of the trail.										
The benches/rest stations seemed to blend in with the natural features.										
The distances between benches/rest stations seemed appropriate to the length of the trail and the demands of the topography (elevation changes).										
Having benches/rest stations at mid-points and at the tops of steeper slopes helped make those grades more manageable by providing places to rest at peak exertion points.										
Benches/rest stations were ideally located and oriented to provide optimal opportunities for sensory experience as well as solitude and reflection.										
The arrangement (configuration or layout) of rest stations afforded excellent opportunities for social interaction for groups.										
The design materials, and placement of trail structures (benches, bridges, and retaining walls) were well integrated into the landscape.										
THE SITE										
Construction of the trail does not appear to have negatively impacted the physical features or the aesthetic appeal of the site.										
The amount and types of modification made for the trail seem adequate and appropriate to the setting.										
The setting was an excellent choice for a nature trail.										
THE TRAIL										
The trail surface was barrier-free, firm, stable, and provided good traction.										
The trail surface had a natural appearance and blended well with the environment.										
The route of the trail provided a satisfying variety of scenery and topography.										
The route of the trail followed the natural contours of the landscape.										
The trail was well integrated into the landscape.										

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 2

TRAIL EVALUATION

	LEVEL OF AGREEMENT					IMPORTANCE				
	strongly agree	agree somewhat	neither agree nor disagree	disagree somewhat	strongly disagree	one of the most important	very important	somewhat important	not very important	not at all important
The width of the trail was adequate for safety, comfort, and ease of passing and side by side travel without seeming to be too wide.										
The length of the trail seemed about right, meaning adequate to provide a satisfying outdoor experience without being too demanding.										
The slopes along the trail enhanced the enjoyment of the outdoor experience without being too challenging.										
Steeper grades were made less challenging by the angle of the trail across slopes, well paced benches/rest stations, and the use of strategically placed plateaus and directional changes (modified switchbacks...curves or bends in the trail on grade sections.)										
The cross-slope was never so steep as to cause difficulty or discomfort.										
The trail seemed to showcase the beauty and most positive aspects of the site.										
The trail facilitated enjoyment of the special elements and features of the site.										
All amenities, accommodations, and trail design features which permit universal access are adequate and appropriate without detracting from the natural setting, the general character of the trail, or the enjoyment of the trail experience.										
The trail provides opportunities for quality outdoor experience with loved ones.										
The trail helped me experience a sense of connection with nature.										
I think anyone (with or without disabilities) could enjoy this trail.										

Thank you for your responses.
Please rate the trail and provide comments on the next page.

Mark opinions on AGREEMENT ***and*** IMPORTANCE for each statement. 3

TRAIL EVALUATION

RATING	Circle one response per question				
Considering setting, design and layout, structures, materials, and craftsmanship, how would you rate the SFA Trail overall?	superior	excellent	good	average	poor
How would you rate the SFA Trail with respect to satisfying your preferences, needs, and expectations for a nature trail?	superior	excellent	good	average	poor
How would you rate the SFA Trail compared to other nature trails with which you are familiar? (Omit if not familiar with others.)	superior	somewhat better	comparable	somewhat worse	inferior
How would you rate the SFA Trail compared to other universally accessible trails with which you are familiar? (Omit if not familiar with others.)	superior	somewhat better	comparable	somewhat worse	inferior
Would you recommend the SFA Trail to others?	yes	no			
Would you come back to use the SFA Trail?	yes	no			

ADDITIONAL COMMENTS AND/OR SUGGESTIONS:

APPENDIX F

Kirkindall Committee

Kirkindall Committee

Dr. R. Scott Beasley, Dean, Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX

Dr. Ray Darville*, Associate Professor of Sociology, Stephen F. Austin State University, Nacogdoches, TX

Dr. David L. Jeffrey, Associate Vice President, Graduate Studies and Research, Stephen F. Austin State University, Nacogdoches, TX

Dr. Michael H. Legg, Assistant Dean, Arthur Temple College of Forestry, Stephen F. Austin State University, Nacogdoches, TX

Dr. Ronald E. Thill, Project Leader, USDA Forest Service, Wildlife Habitat and Silviculture Laboratory, Nacogdoches, TX

*Dr. Darville had not yet joined the Committee when the questionnaire forms were submitted for review.

VITA

Steve Kirkindall was born in Orange, Texas November 20, 1949, the younger of Bill and Margaret Kirkindall's two sons. After graduating from Stark High School in 1967, he attended Schreiner College in Kerrville, Texas. He earned three degrees from Lamar University: Bachelor of Arts in English, 1971; Master of Education in Guidance and Counseling, 1979; and Bachelor of Science in Psychology, 1984.

Steve has a work history as diverse as his educational background. He has stevedored on the docks along the Texas/Louisiana gulf coast and sung in the honky tonks around Austin. He worked with troubled youths and taught high school and college in his hometown. He has planted trees in some of the Pacific Northwest's most remote areas and counseled adult psychiatric patients in one of the largest cities in the country.

He came to the College of Forestry at Stephen F. Austin State University in 1992 with a commitment born of his ties to the mixed pine/hardwood forests of this region. His goal is to nurture appreciation of our natural heritage through conservation education, natural resource interpretation, and non-consumptive resource management. He was awarded the degree of Doctor of Philosophy in Forestry (Forest Recreation) in August 1999.

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APA Style
Dissertation typed by Steve Kirkindall